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Proceedings
of the Marine Safety Council

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United States
Coast Guard

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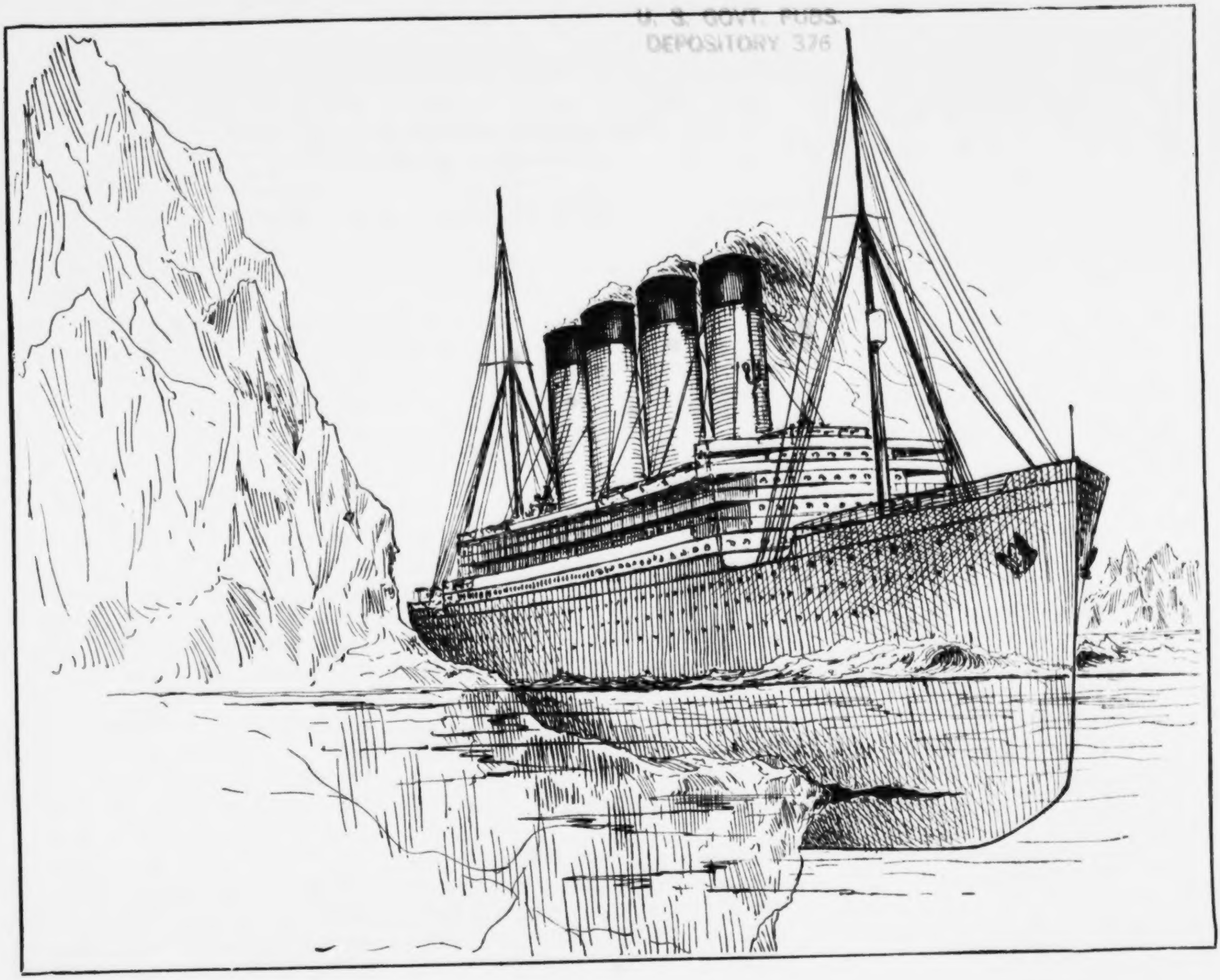

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Proceedings
of the Marine Safety Council

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cover

The TITANIC went down on April 15, 1912. Although many people died during this tragic sinking, a surprising number survived, thanks to favorable weather conditions and the successful launching of the lifeboats. The sinking of the TITANIC had far-reaching effects on maritime law and led to, among other things, the establishment of the International Ice Patrol. A sequence of articles on the TITANIC and related subjects begins on page 9.

READEX FICHE best copy available

A Letter to the Editor

I would like to thank you for printing the article "Close Encounters of a Dangerous Kind" in the Sept/Oct 1981 issue. It is reassuring to see that someone is at least trying to explain to boaters the dangers in approaching large vessels and tows, especially in restricted channels.

As a mate on an ocean-going tugboat, I cannot begin to count the number of times I have seen close calls involving small recreational boaters. The amazing thing is that the number of deaths and injuries has been relatively small. The incidents described in your article point to the need for licensing and instruction for pleasure boaters.

Recently, in Long Island Sound, several people were killed when the operator of a pleasure craft approached too close to a tug with a barge "on the hawser" behind it. However the legal case may turn out, it is obvious that the primary reason for this tragedy was the ignorance and poor judgment of the operator.

Something that your article did not cover was the special hazard in approaching tows "on the hawser." The tugboat operator is severely limited in the actions he can take in a close-quarters situation:

1. He can stop or back the engines, but the barge will keep on coming, possibly running over the tug or tripping (capsizing) it.
2. He can turn one way or the other, but the barge will not turn as quickly. In a sharp turn with a heavy barge, the end result will be the tug going in one direction, the barge in another, with the wire or hawser stretched out in between, mowing down anything in between.
3. He can speed up (if he has any power in reserve) and hope to get ahead of the closing boat. This may decrease the likelihood of a collision but will increase the severity of the damage should the maneuver fail.

In short, his options are limited to early and substantial actions, which may be nullified by the capricious and unpredictable course zigzags of the small boat operator or made impossible by the confines of the channel or nearby shoals. It would seem that the small outboard "rowboat," with a draft of perhaps three or four feet, nevertheless finds it imperative to use the center of the main ship channel, while the tug must scrape past the channel markers to avoid hitting him.

I can only hope that your article, and ones similar to it, will be given wide dissemination to the recreational boating public.

Ron DeMello
Portland, Maine

Conflicts between recreational boats and commercial vessels are a serious problem and should be recognized as such by operators of both types of vessels. How do our other readers feel about this subject? Please share your thoughts or experiences with us.—Ed.

Maritime Sidelights

Coast Guardsman Receives New Award for Rescue at Sea

The Association for Rescue at Sea, Inc., recently presented the first of what is to be an annual award, a Gold Medal for Rescue at Sea. The recipient was Coast Guard Boatswains Mate First Class Matthew C. Greer, coxswain of a 44-foot motor lifeboat from Coast Guard Station Beach Haven, New Jersey. Greer pulled two crewmen from a barge that had grounded five miles north of Atlantic City on January 4, 1981. Seas were running to 20 feet with zero visibility. As the men were pulled aboard the lifeboat, one of them shook Greer's hand and said, "Thanks a lot. You gotta be nuts."

The Association was formed in 1976. Its purpose is to promote rescue at sea and to articulate what others are doing in this respect so that they can work in a climate that recognizes the humanitarian aspect of lifesaving at sea. So far, it has collected more than a quarter of a million dollars for the Royal National Lifeboat Institution of Great Britain and given support to the volunteer Bahamas Air-Sea Rescue Association in Nassau. The Association is interested in becoming more involved in domestic lifesaving. To that end, it is seeking new members. Anyone with an interest in safety of life at sea can become a member by making a $25 annual donation. Interested parties should write to:

Association for Rescue at Sea, Inc.
National Westminster Bank Limited
100 Wall Street
New York, NY 10005

National Safety Council Presents General Chairman's Award

Ron Bohn, Hazardous Materials Manager for United States Navigation, Inc. (a subsidiary of Hapag-Lloyd, Inc.), was presented with a General Chairman's Award by the National Safety Council (NSC) at ceremonies held recently in Chicago.

The NSC's Marine Section Best Paper Awards Committee singled out Mr. Bohn for recognition on the basis of his paper "The Why and How of Control Procedures for the Acceptances of Hazardous Materials/Dangerous Goods Offered as Ocean Export Cargoes." The paper was presented at the NSC's 68th National Safety Congress and Exposition in October 1980.

Among the topics Mr. Bohn's award-winning paper dealt with was what elements are important in carrying through control procedures in hazardous cargo shipping. Here Bohn points to the "5 P's": Push, People, Papers, Probing, and Persistence. These five factors, he explains, are necessary for effective and safe handling and shipping of dangerous cargo.

Bohn, who has been with United States Navigation since 1973, has 35 years' experience in the maritime and transportation fields. In addition to his duties at United States Navigation, he teaches a night course, "Ocean Transportation of Hazardous Materials," at the Roosevelt Institute of Maritime Studies in New York City.

Correction

Because of a printer's error, the photographs on page 206 of the November 1981 issue of the Proceedings ("How a Hull Takes Stress") do not correspond to their captions. The photograph at the top of the page should be relabeled **Figure 3**, the middle photograph should be relabeled **Figure 1**, and the bottom photograph should be relabeled **Figure 2**. Many thanks to the readers who wrote to point out the error.

Slide Show on Visual Distress Signals Available

The Coast Guard has produced and distributed a sound/slide show to clarify the new regulation requiring the carriage of visual distress signals on recreational boats. The show explains where and how many types of signaling devices are to be carried, the various types available, when and how to use them, and how to safely handle and store them.

The sound/slide show is available from local Coast Guard Boating Safety Offices or through the Coast Guard Auxiliary. It can also be ordered from the Boating Education Branch at Headquarters by writing to: Commandant (G-BEL-4), U.S. Coast Guard, Washington, DC 20593.

SNAME Announces Scholarships

Scholarships at both the graduate and undergraduate levels are again being provided by The Society of Naval Architects and Marine Engineers to encourage men and women to pursue studies in the naval architectural and marine engineering or closely related fields. Only United States or Canadian citizens are eligible.

Applications for the graduate scholarships program for the Fall of 1982 may be obtained from Society headquarters at One World Trade Center, Suite 1369, New York, NY 10048. The completed applications should be directed to Mr. Robert G. Mende, Secretary and Executive Director of the Society, at that same address before the closing date of February 1, 1982.

The Scholarships Committee will determine the value of the awards on a case-by-case basis. Each successful candidate may select the institution he or she will attend, subject to the approval of the the Scholarships Committee.

Factors considered in making the selection include scholastic ability, the candidate's capacity to pursue advanced study, ambition, personality, and other qualities indicative of prospective leadership status in the marine industry. For at least one scholarship, recent employment of at least five years' duration in the marine field will be an important factor in selection.

In addition to the graduate program, several undergraduate scholarships of $1,000 each are available for study at the Massachusetts Institute of Technology, the University of Michigan, and the State University of New York Maritime College. Grants-in-aid are being made available at the University of California at Berkeley.

Those interested in the undergraduate scholarships should contact the institutions listed above rather than the Society, since nominations for Society undergraduate funds have been assigned to them. All undergraduate scholarship awards will be subject to the approval of the Scholarships Committee. ⚓

Keynotes

The following items of general interest were published between October 23, 1981, and November 19, 1981:

Final rules: CGD 78-171 Drawbridge Operation Regulations; Gulf Intracoastal Waterway, Pinellas County, Florida, November 5, 1981. CGD 81-076 Bridges; Location and Clearances; Advance Approval of Construction Projects, revocation; November 5, 1981. CGD 80-069 Regulated Navigation Area; New Haven Harbor, Vicinity of Tomlinson Bridge, November 16, 1981. CGD 17-81-04 Safety Zone; Gastineau Channel, Juneau, Alaska, November 16, 1981. CGD 80-116 Portable Deadlights on Great Lakes Vessels, November 19, 1981.

Notices of Proposed Rulemaking (NPRMs): CGD 17-81-03 Safety Zone; Gastineau Channel, Juneau, Alaska, November 5, 1981. CGD 81-054 Drawbridge Operation Regulations; Saginaw River, Michigan, November 16, 1981. CGD 2-81-01 Drawbridge Operation Regulations; Muskingum River, Ohio, November 16, 1981.

Notices: CGD 81-083 Coast Guard Academy Advisory Committee, notice of meeting, October 29, 1981. CGD 81-084 Safety and Security Zones, notice of temporary rules, November 5, 1981. CGD 81-085 Towing Safety Advisory Committee (TSAC), notice of meeting, November 9, 1981.

Any questions regarding regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-1477.

* * *

Exemptions Granted to Oceanographic Research Vessels

Merchant seamen are in many cases hired on a voyage-to-voyage basis. Because this type of arrangement makes them, in effect, temporary and itinerant workers, regulations have been promulgated to protect their interests. These regulations cover a number of employment conditions, such as signing on, discharge, payment, and personal outfitting.

Employment conditions differ on oceanographic research vessels. Because of the specialized nature of the work done on such vessels, merchant seamen are hired for extended periods of time on a long-term, contractual basis. This makes regulations governing short-term employment irrelevant.

Recognizing this, the Coast Guard on November 16, 1981, published a final rule (Docket No. 77-081) amending present regulations. The new regulations standardize qualifications for the designation "Oceanographic Research Vessel" and exempt such vessels from the requirements of the protective legislation described above. Vessel operators will be required to submit information on operation of their vessels as research vessels to the local Officer in Charge of Marine Inspection (OCMI). The OCMI will then forward this information to the Commandant with a recommendation for approval or denial of the designation "Oceanographic Research Vessel."

Comments Requested on Changes in Mariner Licensing

Mariners trying to plot their career paths are often frustrated by antiquated regulations and confusing licensing requirements. The Coast Guard, hoping to ease the way, has proposed a set of changes which would greatly simplify the licensing process, providing mariners with a clearly defined path to follow.

Among the goals of this proposed regulatory change are:

1. Establishing a simplified, two-license structure for service on vessels of any gross tonnage operating on the Inland Waters, Western Rivers, or Great Lakes of the United States. This would replace the present four-license system. The two-license system would also apply for service on vessels of up to 1600 gross tons operating in ocean or near-coastal service, so that the new U.S. rules would conform with many international standards. The existing four-license structure would continue to apply to vessels over 1600 tons on offshore routes.
2. Consolidating many existing licenses. As the regulations stand now, the number of licenses, the requirements for them, and the experience necessary to obtain a license are often confusing. Consolidation would allow for a crossover between licenses and more uniform career advancement. For example, there are

presently 24 different licenses for master, many of which could be grouped together and would be under the new regulations. General licensing requirements, often repeated for many different licenses, would be consolidated into one section of the regulations to eliminate confusion and redundancy. Archaic experience requirements would be revised. For example, under the existing regulations, in order to obtain a license as a master of an ocean or coastwise sail vessel, an applicant must have one year of service on an uninspected ocean or coastwise sail vessel of 500 or more gross tons. No vessels of this type exist under the U.S. flag. This requirement would be dropped.

3. Eliminating the difference between inspected and uninspected vessels for licensing purposes. This would, for instance, provide holders of an Operator-Uninspected Towing Vessel license with a clearly defined path to mate and master.

4. Enabling persons with experience in one broad geographic area to cross over into the adjacent area. A person with an inland route limitation, for example, would be able to cross over into an ocean or near-coastal route. This would give him greater opportunities for career advancement.

The language of the regulations would be simplified, and the changes and amendments to the rules would further clarify licensing requirements.

An advance notice of proposed rulemaking (ANPRM) on this subject was published on October 29, 1981. Comments about the proposed rule (Docket No. CGD 81-059) should be mailed to the Marine Safety Council at the address given above on or before January 27, 1982.

Documentation of Vessels to be Simplified

Documentation of vessels dates back almost two centuries; the first regulations on this subject were passed in 1789. Documentation serves as evidence of a vessel's nationality and allows vessels to obtain preferred mortgages. It is required for vessels operating in certain trades such as fishing or trade on the Great Lakes. Because some of the regulations are so old and only piecemeal attempts have been made to update them, vessel documentation regulations are often confusing and filled with archaic language. Also, the burdensome reporting requirements of the regulations force vessel owners to fill out a myriad of forms.

On July 1, 1982, the Vessel Documentation Act of 1980 becomes effective. This Act mandates the revision and simplification of laws relating to vessel documentation.

In accordance with the Act, the Coast Guard has completely rewritten the rules in clearer language. The new text can be found in an NPRM published November 16, 1981. The rewriting will make it easier to determine which rules apply in a given situation and what is required of a vessel owner. In conjunction with rewriting the rules, the Coast Guard is introducing condensed and simplified documentation forms. These will require only the information specified in the regulations, easing the paperwork burden on the public. Streamlined application procedures will reduce documentation processing backlogs.

Comments about this proposal (Docket No. CGD 80-107) should be sent to the Marine Safety Council at the address given above before January 15, 1981.

Load Line Survey Fees to be Deregulated

If a ship is overloaded with cargo, it will become unstable, endangering both the cargo and personnel. Overloading is prevented by means of a load line assignment which specifies the deepest draft amidships to which a ship can be safely loaded. The majority of such surveys are conducted by the American Bureau of Shipping (ABS), which reserves the right to charge for this service. The fees charged are monitored by the Coast Guard.

Currently, if the ABS wishes to increase its survey fees (which, in these inflationary times, often becomes necessary), the regulatory process takes so long that the new fees have been overtaken by further inflation before they go into effect. In an NPRM published on November 5, 1981 (Docket No. CGD 80-143), the Coast Guard proposed a change in the regulations which would allow the ABS and any other classification society assigning load lines for the United States to raise its survey fees without going through the regulatory process. The new rule would require only the Commandant's approval for an increase in fees.

This change is not meant to imply that load line survey fees will become overly burdensome. The average annual cost of survey fees currently is only about $100 per vessel, and the price increases are expected to have only a very modest economic impact.

Actions of the Marine Safety Council

October Meeting

CGD 80-107 Documentation of Vessels

An NPRM containing extensive changes to the Coast Guard documentation regulations (Chapter 46 of the Code of Federal Regulations, Subchapter G), was approved by the Council. This project was the result of the Vessel Documentation Act, P.L. 96-594, which becomes effective on July 1, 1982. The Act mandates elimination of unnecessary requirements and simplification of the remaining requirements. (For further details, see the write-up on the preceding page of the Keynotes section)

CGD 81-076 Bridge Location and Clearances, Advance Approval

The Coast Guard is authorized to approve the location and plans of bridges constructed over navigable waters of the United States. Chapter 33 of the Code of Federal Regulations, Part 115.70 (33 CFR 115.70) provides a means for advance approval to be given on bridge construction projects over waterways that are "navigable in law" but not actually navigated by anything but logs, log rafts, rowboats, canoes, and small motorboats. There is no need for the Coast Guard to "approve" bridge locations and construction plans for such waterways. This project, administrative in nature, merely deletes those portions of 33 CFR 115.70 which are not being applied. A final rule was published in the Federal Register on November 5, 1981.

CGD 81-078 Self-propelled Vessels Carrying Hazardous Liquids

This proposal will update 46 CFR 153 by identifying additional cargoes subject to these regulations, correcting minor errors in the text, and relaxing certain existing requirements. An NPRM is scheduled to be published in March.

CGD 81-079 Acceptance of ASME-stamped Power and Heating Boilers

As a part of the Coast Guard's ongoing program to deregulate without sacrificing safety, this project will exempt boilers stamped with the American Society of Mechanical Engineers (ASME) A, E, H, or S symbols from Coast Guard plan approval and shop inspection. A third-party inspection by an ASME code-authorized inspector will be accepted. An NPRM will be issued this summer.

November Meeting

CGD 81-080 Traffic Separation Schemes, Shipping Safety Fairways

As provided for by the Ports and Waterways Safety Act, the Coast Guard undertook a study to determine the need for changes, deletions, or additions to traffic separation schemes and shipping safety fairways in offshore areas. The information compiled is being categorized by Coast Guard District. The project described here is the result of the findings within the Eight Coast Guard District. The following are being proposed:

Two additional anchorages for Sabine Bank

One additional anchorage for Calcasieu Pass/Lake Charles

Repositioning the fairway from the mouth of the Mermentau River to the channel at Lower Mud Lake

Widening the fairway off Southwest Pass

Establishing a Traffic Separation Scheme (TSS) at the entrance to Galveston

The NPRM should be issued in March.

CGD 81-081 Electronic Position Fixing Devices

Presently, 33 CFR 164.41 requires that, for satellite packages installed after June 1, 1982, vessels equipped with a hybrid satellite system install a continual-tracking integrated complementary system that automatically provides position updates at intervals of one minute or less. It also requires that such a complementary system be incorporated in existing packages not later than June 1, 1985. This project will ultimately eliminate those requirements. An interim final rule is to be published this month.

CGD 81-082 Barges Carrying Certain Bulk Dangerous Cargoes

The rules for barges carrying bulk cargoes presenting hazards other than flammability (46 CFR 151) were published in 1970 and since then have had only minor revisions. A number of sections are outdated; other sections are unnecessary. This project will result in a complete revision of 46 CFR 151. An NPRM is not scheduled to be issued until April 1983. ⚓

Changes in List of Navigation and Vessel Inspection Circulars

The December 1981 issue of the Proceedings featured an update of the Coast Guard's list of Navigation and Vessel Inspection Circulars (pp. 238 - 239). A number of changes were taking place as the issue went to press, however, and the list should be adjusted as follows:

10-81 Coast Guard Certification and Inspection of Certain Categories of Existing Vessels

should be added to the list. 10-81 cancels the following circular:

12-65 Alteration or Modification of Existing Cargo or Tank Vessels; Associated Safety Improvements.

The two circulars announced in the Maritime Sidelights section of the December 1981 issue of the Proceedings,

11-81 Renewal of Deck Officers' Licenses

and

12-81 Operators' and Motorboat Operators' Licenses,

cancel the following circulars:

5-62	Renewal of Deck Officers' Licenses—Western Rivers
5-64 CH-1,2	Renewal of Ocean Operators' and Operators' Licenses
8-64	Renewal of Operators' Licenses—Western Rivers
8-64A	Renewal of Operators' Licenses—Western Rivers
7-65 CH-1	Renewal of Deck Officers' Licenses

Two other circulars will be cancelled on the date when the new Inland Navigation Rules become effective on the Great Lakes:

4-62 Renewal of Deck Officers' Licenses—Great Lakes

and

7-64 Renewal of Operators' Licenses—Great Lakes.

The Wake of the TITANIC

by PA3 Jeffrey D. Moore
Assistant Coast Guard Historian

On April 10, 1912, a mammoth ship lay moored at the docks of Southampton. With its sleek shape and its picturesque features, the TITANIC was the pride of not only the White Star Fleet but England as well. Soon the ship would be making history—and changing maritime laws.

As the passengers boarded the TITANIC, one woman asked a steward whether the ship was really safe. The steward laughed and replied, "Lady, even God Himself couldn't sink this ship." As the officers supervised the boarding of the massive liner, some of them knew there were enough lifeboats for only half the passengers. They were not worried, though, because they believed the ship was unsinkable.

The TITANIC was scheduled to sail from Southampton, England, to New York. Its captain, Commodore Edward J. Smith, with his 45 years of experience, was considered the best in his profession. It was only fitting, therefore, that he command the queen of the ocean on his final cruise before retirement. The rest of the officer corps had been handpicked by the White Star Line executives. The officers were well seasoned in the handling of passenger liners.

By 12:00 noon all 2,201 passengers and crewmembers were aboard, and the 50,000-ton colossus sailed away to keep its appointment with destiny.

The first few days of the trip passed uneventfully, as the passengers settled into the routine of life on board a luxury liner. The TITANIC began to receive word of icebergs from other vessels on the third day of its voyage. The captain remained unperturbed, and the TITANIC continued to cut cleanly through the waters of the Atlantic.

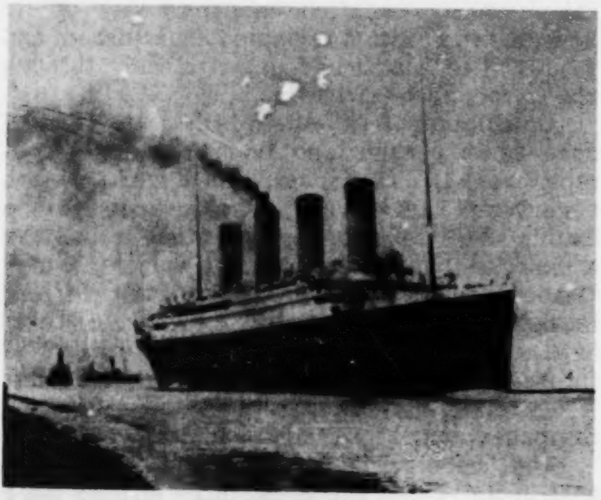
On the night of April 14th the TITANIC once again received notice of icebergs from other vessels. The captain did not slow the huge vessel but did add extra lookouts to the watch. At 11:40 p.m. a fog settled around the ship. Then, from the lookout, came the cry, "Iceberg dead ahead, sir!" The First Officer immediately gave the order to bring the wheel hard over. In the next instant the lever was thrown to make the engines go full astern. But it was too late. By the time the huge liner responded, its hull was scraping the iceberg.

The iceberg ripped a huge, 300-foot-long gash in the side of the vessel. The engines were stopped, and Captain Smith came to the bridge. After he saw what had happened, he went to inspect the damage. It was bad, much worse than he would have anticipated. Smith realized he could do nothing. The TITANIC, the "unsinkable" ship, would go under. The captain ordered general quarters to be sounded and distress signals to be fired.

The stewards roused the passengers from their cabins and ushered them to the decks from which the lifeboats were accessible. The passengers, for the most part, could not or would not comprehend the extent of the danger. Many refused to enter the boats; others entered hesitantly. In the background, distress rockets could be seen exploding in the air and the ship's band could be heard playing. By the time all of the lifeboats had been launched, the ship was leaning heavily into the water. The people that remained on board hoped the vessel would sink only so far and then hold. Their hopes died as the TITANIC took its final plunge into the sea. It took only two hours and forty minutes for the unsinkable TITANIC to sink.

The people that did survive in the lifeboats were, in fact, very lucky. In the early 1900s the percentage of survivors in maritime accidents was very low. During this era, only one out of three lifeboats came away from a casualty without any severe damage or loss of life. According to "The Return of Casualties and Loss of Life," 40,860 lives were lost on merchant vessels between July 1, 1914, and December 31, 1918. Most of the vessels lost had enough lifesaving apparatus on board. Because of the prevailing conditions, however, lowering the lifeboats proved disastrous.

Many factors could adversely influence the launching of a lifeboat at the time of distress. One major problem could be the listing of the vessel. If the vessel listed more than 35°, it was almost impossible to launch the lifeboats on the high side of the ship. Listing also scared many of the members of the crew, as they wanted to stay on the high side of the ship instead of lowering the lifeboats at the low end, where it would be a straight drop to the water.



The luxury liner TITANIC departs Southampton, England, on its maiden—and what was to be its final—voyage.

Another adverse condition might be the sea state. In many cases the ocean was rough. This caused the vessel to pitch and roll, which, in turn, caused the wooden lifeboats to crash against the hull of the ship and shatter into driftwood. The rough water also made it difficult to lower a lifeboat into the sea, since the entry had to be timed to meet the swells. The boat had to be placed on top of the wave and the lowering lines let go at that very moment. If the timing was not perfect, the lifeboat might swamp or be smashed against the hull and all could be lost.

Such adverse conditions did not prevail during the TITANIC disaster. The night was clear, and the ocean was abnormally calm. The conditions were perfect for launching lifeboats. This was lucky for the crew of the TITANIC because they had had no previous drill or practice on the ship's davits. Had the night been rough, the loss of life would have even been more disastrous.

The TITANIC had 20 lifeboats, fourteen of which were 30 feet long and 9 feet wide and had a capacity of 65 people each. The ship had two 25-footers which could hold 40 persons each. Finally, the TITANIC had four Engelhardt collapsible boats, 27 feet long, which could hold 47 people each. In all, the boats could hold 1,178 people, scarcely more than half the people on board. The TITANIC also had 3,560 Board-of-Trade-inspected life jackets. These were placed throughout the ship's sleeping quarters.

The boats had been made to comply with the requirements of the English Board of Trade. The stem and stern posts were made of oak and the keels of elm. The hulls of the boats were built of yellow pine planks, overlapped and double-fastened with copper nails, clinched over roofs. The timbers were made of elm and spaced about nine inches apart. The seats were made of pitch pine secured with galvanized iron double knees. All of the lifeboats were fitted with Murray's disengaging gear, which was capable of freeing both ends of the boat in case of emergency. This gear was fastened at suitable distances from the forward and after ends of the boats. The lifelines were fitted around the gunwales of the lifeboats.

The lifeboats were stowed on wooden hinged chocks on the boat deck. Fourteen were hung inboard on davits, seven on the port side and seven on the starboard side of the liner. There were two emergency boats. They were in davits also but hung outboard, one on the port side and one on the starboard side. Of the other four boats, which were stowed on the boat deck, two were placed on top of the officers' cabin roofs.

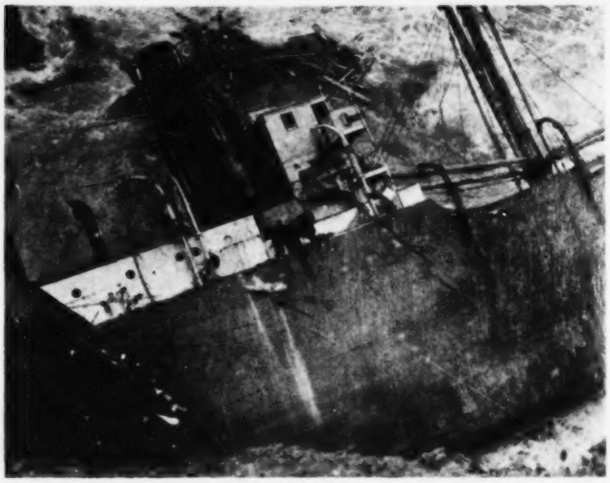
All of the equipment used in the lifeboats met with the specifications of the Trade Board. The equipment included sails for each lifeboat, covers, a sea anchor, a boat compass with a fitting to hold it, and a provisional tank and water beaker.

The TITANIC also had one of the safest and most modern davits that existed at the time. The davit was called "the Welin Davit" after its inventor. One of the features of this davit was its flexibility. The davits were capable of moving in many directions and could be easily stored. The davits were also designed to provide whatever clearance was necessary for a boat to clear the side of the vessel. The lifeboats on the davits could be stored in many positions or at many angles on the davits, thus leaving more deck space. The quadrant could be moved to 90° angles. This gave the davit more versatility and maneuverability in the launching of lifeboats. Although the davits were not tested by rough weather during the TITANIC disaster, the Welin davits were one of the reasons that every lifeboat launched on that fateful night made it to the water without mishap.

As mentioned previously, there was enough room in the lifeboats for 1,178 people. Many of the passengers were convinced the TITANIC could not sink, however, and 467 spaces went unfilled. The boats were thus filled to less than two-thirds of their capacity, and 467 people died needlessly.

From November 12, 1913, to January 20, 1914, shortly after the sinking of the TITANIC, the International Conference on the Safety of Life at Sea was held in London. Most of the principal maritime countries were represented. The purpose of this meeting was to raise the level of safety on board merchant vessels.

The following recommendations were made:



This photograph of the SS LAMUT shows what can happen when the lowering of the lifeboat (vessel at lower left) is not timed correctly.

1) Vessels should provide enough lifeboats, floats, rafts, and line-carrying projectiles and means for propelling them for everyone on board.
2) Every vessel should carry one life preserver for each person on board.
3) Every vessel should be equipped with suitable pipes (water lines) leading to any and all sections of the vessel for extinguishing fires.
4) Vessels should have a sufficient number of hand pumps (determined according to the number of crewmembers and the type of cargo being carried).
5) Vessels should have a sufficient number of fire extinguishers.
6) Every motor or steam vessel over 65 feet long should carry an extinguisher capable of putting out a gasoline fire.

A number of other suggestions were made at the meeting as well. The United States failed to ratify the international convention, but it did accept in large measure the new guidelines.

Even though the TITANIC went down many years ago, it is still one of the most famous sinkings of all time. Although the losses were tragic, the lessons learned from the sinking served to advance the cause of marine safety. The International Ice Patrol was formed in order to study the flow and structure of icebergs. Strict safety laws were passed regarding the number of lifeboats and other flotation devices to be kept on board.

The sinking of the TITANIC also served to remind man that, no matter how grand the ship, safety on the world's seas should never be taken for granted. ⚓

Coast Guard Puts a Patrol "on Ice"

Of all the peacetime hazards of the sea, none is more fearsome, unyielding, or treacherous than the iceberg. Breaking off the massive Greenland glaciers, mammoth bergs, frequently as long as a city block and half as high above the water, are carried along by ocean currents.

While icebergs are a constant menace in the Arctic, some are carried far south to the vicinity of the Grand Banks of Newfoundland by the cold, southward-flowing Labrador Current. Here lie the great circle shipping tracks between Europe and the major ports of the northeast United States and Canada.

The U.S. Coast Guard formally commences the seasonal service of ice observation and International Ice Patrol whenever the presence of ice begins to threaten these primary shipping routes. The threat of ice south and east of Newfoundland is typically present during the months of February through July, but the Patrol is flexible and commences operations when conditions dictate. The 1972 season, the longest on record, ran from February 29th through September 4th, 189 days. Except during unusually heavy ice years, the Grand Banks are normally ice-free from August through January.

HISTORY OF THE ICE PATROL

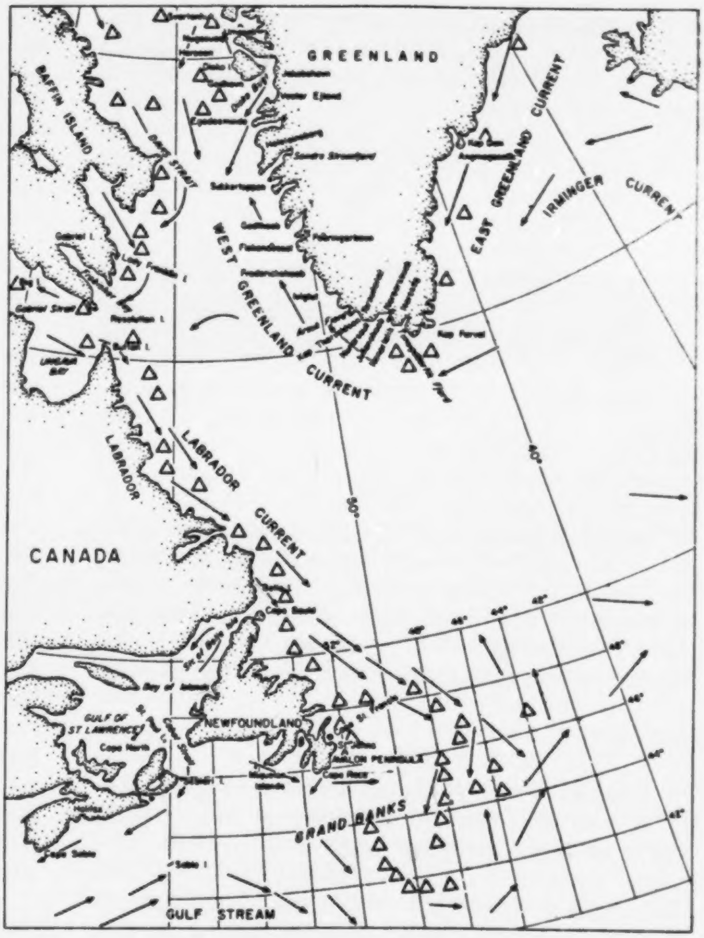
It took one of the greatest marine disasters of all time to arouse sufficient public demand for international cooperative action to deal with the iceberg hazard. The sinking of the SS TITANIC on April 15, 1912, was the prime impetus for the establishment of the International Ice Patrol.

On its maiden voyage from Southampton, England, bound for New York, the TITANIC collided with a medium-sized iceberg just south of the Tail of the Grand Banks. It sank within two hours and forty minutes. Although the night was clear and seas were calm, the loss of life was enormous. More than 1,500 of the 2,201 passengers and crew perished. The TITANIC, the brand-new flagship of the White Star Line, was the largest passenger liner of its time, displacing 66,000 tons and capable of sustained speed in excess of 22 knots. It had been built to incorporate the latest developments in safety design and featured compartmentation and such innovations as automatically closing watertight doors. It is ironic that publicity regarding these features had given it the reputation of being unsinkable.

The loss of the TITANIC gripped the world with a chilling awareness of an iceberg's potential for tragedy. The first Safety of Life at Sea (SOLAS) conference was held in 1914.

After the TITANIC disaster, the U.S. Navy assigned the ships CHESTER and BIRMINGHAM to patrol the Grand Banks for the remainder of 1912. In 1913, the Navy could not spare ships for this purpose, so the Revenue Cutter Service (the forerunner of the U.S. Coast Guard) assumed responsibility, assigning the Cutters SENECA and MIAMI to conduct the patrol.

From the inception of the Ice Patrol until the beginning of World War II, ice conditions were monitored from two surface patrol cutters alternating surveillance patrols of the southern ice limits. In 1931 a third ship was added to perform oceanographic observations in the vicinity of the Grand Banks. After World War II, aerial surveillance became the primary ice reconnaissance method. Surface patrols were phased out; from that point on, that type of patrol was used only during unusually heavy ice years or extended periods of reduced visibility. Use of the oceanographic vessel has continued. The aircraft has distinct advantages for ice reconnaissance, since it can cover a much greater area in a relatively short period of time.



Arrows show the drift of icebergs from their source into the North Atlantic Ocean.

SEA ICE

Ice floating in the ocean is of two general types. That forming over land masses, such as Greenland, is known as glacial ice. That originating and developing entirely in the sea itself or in the waters along a coast is termed sea ice.

The two chief sources of arctic sea ice for the western Atlantic are the Davis Strait and Hudson Strait. The winter ice stream from Baffin Bay reaches Hudson Strait in late October or early November. The streams move down the Labrador coast, growing as new ice forms along the way. The first ice to arrive off Belle Isle in December or January is open strings of young ice. Some of this ice enters the Strait along the northern side and soon fills the entire Strait, closing the Belle Isle route to navigation until late May or June.

By late January or early February, this ice has reached the northern edge of the Grand Banks, and by March the pack has spread generally over the northern part of the Banks, often as far south as latitude 46 N.

To the navigator, there are two reliable signs of sea ice. One is iceblink or ice sky. The presence of any appreciable expanse of sea ice produces characteristic light effects in the sky above it which, once seen and recognized, can never be mistaken. The phenomenon is caused by the very high percentage of light reflected from the ice surface as compared to that reflected from the surrounding sea and is observed sometime before the ice appears over the horizon. On clear days when the sky is mostly blue, iceblink appears on the horizon in the direction of the ice as a luminous yellow haze, contrasting sharply with the rest of the horizon. It is brighter at the bottom and shades off upward; its height depends on the proximity of the ice field. Horizontally, the effect extends only as far as the ends of the ice. On days when the sky is overcast or there are low clouds, the yellow band is mostly absent, but the iceblink appears as a whitish glare on the lower surface of the clouds above it. Under certain conditions of sun and sky, both effects may occur at once, a sure indication of field ice just over the horizon. Here might also be mentioned the term "water sky." This effect is just the reverse of ice sky. If the observer is completely surrounded by ice, or nearly so, the bank of iceblink is sharply broken where leads of open water occur in the icefield. In contrast to the iceblink, the "water sky" above such open water appears almost black.

The second reliable sign of sea ice is the abrupt smoothing of the sea and the gradual lessening of the ordinary ocean swell. The ice cover prevents the wind from acting on the sea; an abrupt smoothing is thus a good indication of sea ice to windward. As for the icefield itself, its leeward edge is apt to be stringy and loose, while the windward edge will usually be sharply defined and closely packed. Pieces of ice to leeward of the pack give warning of an icefield's proximity. (The absence of pieces of ice should not be taken as a sign that no ice is near)

ICEBERGS

Glacial ice is formed when snow accumulates and is gradually compressed into a solid mass of large granular ice. This process produces a structure quite different from sea ice. Air trapped within the ice forms a high density of tiny, high-pressure air pockets, giving the ice a milky appearance and causing it to effervesce as it melts. Since it is formed over land, glacial ice is essentially salt-free.

Greenland is covered with an ice cap of glacial ice nearly two miles thick in some locations. Icebergs are produced when the buoyant forces of water act to break off sizable pieces of ice from the seaward end of these glaciers.

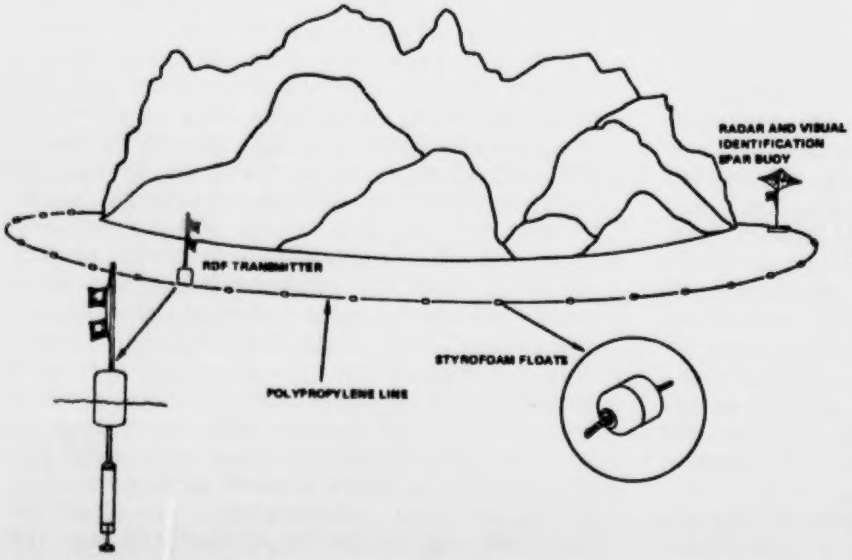
Those bergs that reach the North Atlantic Ocean have their principal origin in the 100 tidewater glaciers of West Greenland, where between 10,000 and 15,000 bergs break off, or are "calved," each year. It is estimated that these account for 85 percent of the icebergs which reach the Grand Banks of Newfoundland.

Icebergs originating in West Greenland are initially carried north along the Greenland coast around to the western side of Baffin Bay and then south along the east coast of Baffin Island, Labrador, and Newfoundland to the Grand Banks. Because they have deep drafts of 100 to 200 meters, the larger bergs are often slowed by grounding. Their total drift is about 1,800 miles (over 3,000 miles for East Greenland bergs), and many take from 11 months to as long as 3 years to reach the North Atlantic shipping lanes.

On the average, about 1,000 bergs each year survive to reach the region off Belle Isle. The Patrol maintains counts of the number of bergs crossing the 48th parallel.

Icebergs are sighted at various distances, depending on the state of visibility and the height of the berg and the observer.

On a very clear day large bergs can usually be seen by an observer with height of eye 70 feet at a distance of 18 miles. The tops of bergs have been seen at 9 to 11 miles when the weather was clear but there was a low-lying haze around the horizon. In a dense fog, a berg cannot be seen at any appreciable distance ahead of the ship. If seen at all, it may appear as a luminous white mass when the sun is shining. Without the sun, it is dark and somber-looking. In a light, low fog, an observer can see a berg from aloft sooner than from deck. On a clear, dark, starlit night, a lookout will not pick up a berg at a distance greater than one-fourth mile. If the



One iceberg-tagging scheme employed a floating-line technique.

berg's bearing is known, however, an occasional light spot is discernible with binoculars at a distance of a mile because of the swell breaking against the berg. With a full moon and favorable conditions, a berg can normally be seen at greater distances, possibly 3 miles. Much depends on the relative positions of moon, berg, and ship.

Echoes from the ship's whistle are not to be relied upon, both because the shape of the berg may prevent any echo and because echoes are often produced by fog banks.

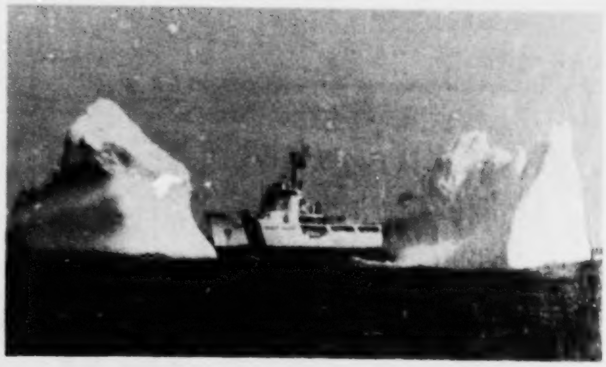
SERVICES FOR THE MARINER

The International Ice Patrol typically commences services for the annual ice season in mid-March. The season usually runs through mid-July. Wide dissemination of the services available to the mariner and the maritime community concerning the location of icebergs and icefields in the North Atlantic is provided by Local Notices to Mariners and radio broadcasts. Merchant vessels are requested to send reports of ice sightings and sea surface temperatures to U.S. and Canadian Coast Guard communications stations for relay to the Commander of the International Ice Patrol. Details on stations, times of broadcast, frequencies, etc., will appear in the next issue of the Proceedings.

RESEARCH AND DEVELOPMENT

New techniques for improving Ice Patrol efficiency and effectiveness are constantly being developed and put into use as man's understanding of the iceberg menace continues to expand. In its efforts to safeguard merchant shipping, the Coast Guard keeps abreast of the latest scientific developments. The Ice Patrol aircraft now use up-to-date electronic navigational equipment which makes it possible to determine iceberg positions with great accuracy. Research and development efforts include ice deterioration studies, Greenland glacier surveys, and numerous and varied oceanographic investigations. The Ice Patrol has also attempted and is continuing to experiment with tagging of icebergs with both dye "bombs" and more recently radio transponders (see below). Test and evaluation is proceeding on remote sensing equipment such as Side-Looking Airborne Radar (SLAR) in the hope that it will enable the Ice Patrol to detect and identify icebergs in reduced visibility.

The Coast Guard began a project in 1974 to determine the best way to tag an iceberg for identification and tracking. The first approach was to encircle an iceberg with a floating line and attach a radio direction-finder transmitter and radio reflectors. This method met with limited success, since icebergs deteriorate and are likely to roll, thus slipping the tagging array. During 1975 instrument packages were tethered to icebergs using a large steel dart dropped from aircraft. This procedure solved some of the problems of iceberg tagging associated with rolling and melting but not those associated with calving.



The U.S. Coast Guard Cutter VIGOROUS is framed in the jaws of a twin-peaked iceberg near a North Atlantic shipping lane. Photo by Seaman Richard J. Geisman

Research continued along these lines until the 1979 season, when significant changes were made in the Ice Patrol mode of operation. A new computer model to predict the drift of icebergs was placed in operation by the Coast Guard and used throughout the season. An ocean current model of the North Atlantic was generated using information obtained since 1964 to predict current motion and thus iceberg drift. Perhaps most significantly, traditional standard oceanographic surveys were replaced with satellite-tracked buoys as the primary method of measuring currents and verifying the International Ice Patrol current file. A continuing evaluation of the iceberg drift model is being conducted. Observed iceberg drift tracks are compared to model-generated paths to estimate the model accuracy. Overall, the satellite-tracked-buoy system, as compared to the old survey method, provides more accurate and much more timely current measurements at a reduced cost. As a result of the International Ice Patrol's ongoing efforts to increase its effectiveness, the future for the continued safety of shipping from the menace of icebergs appears assured. ⚓

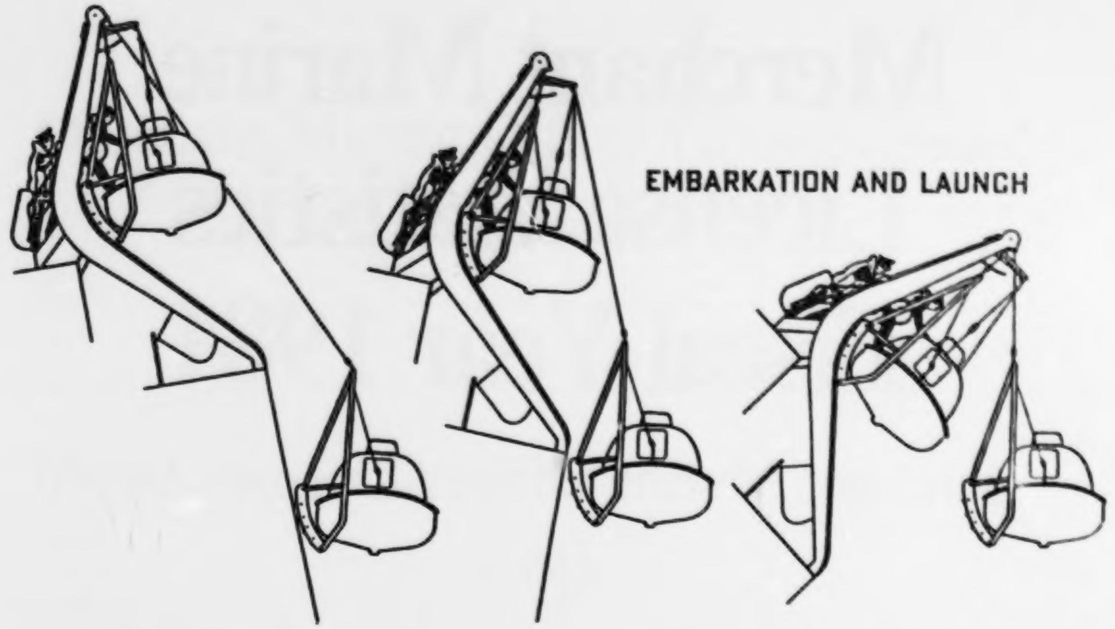
New System Makes Lifeboat Launching Safer

In October 1975 leading manufacturers of lifesaving equipment, in conjunction with the British Department of Trade, carried out extensive and successful sea trials of a prototype launch/recovery system aboard the fishery support ship MIRANDA.

The MIRANDA davit, named after that fishery support vessel, is the result of years of experience in the development of davit systems. The MIRANDA system comprises fixed ramp arms, winch, motor, and a survival craft in its own launch/recovery cradle. The craft is stowed at the embarkation deck position in its cradle, and it is this cradle which is lowered down the face of the fixed ramp arms, at the bottom of which the craft is released. The cradle with its rollers thus provides protection for the boat when it is being lowered, rendering it unnecessary to turn the craft out clear of the ship's side. This eliminates the need for a davit which turns from the inboard to the outboard position and all the maintenance which comes with that type of equipment.

In addition to the protection it affords the survival craft during launch and recovery, the MIRANDA system has the following advantages:

- The craft can be launched with the parent vessel in a 30° high or low side list accompanied by 15° trim either fore or aft (this exceeds international maritime regulations, which require that a davit work with a 15° list and 10° trim).
- The cradle allows personnel to be loaded while the boat is in a fully stowed position. The launching is then controlled by the helmsman from within the craft.
- Other than the rubber-tired wheels on the cradle, the MIRANDA system has very few moving parts. The wheels enable the cradle, with the craft mounted in it, to move down the trackways, over the side of the ship, and into the water.
- The boat's gripes automatically disengage themselves as the boat moves down the



EMBARKATION AND LAUNCH

trackways. Personnel inside the boat disengage it from the cradle by actuating the lever inside the craft to simultaneously operate the release hooks at each end.

- Because of the reduced number of moving parts, the maintenance required to keep these systems in first-class working order is less than that needed for conventional davit systems.

- Since the craft is protected by the cradle, the lifeboats can be launched while the parent vessel still has some way on, before coming to a complete stop. Launching thus does not require the vessel to be dead in the water.

- Recovery of the craft is simple and quick (three minutes or less, depending on the condition of the seas). Hook-up is made by engaging a lightweight snap hook on the recovery pendant to the falls above the cradle; the other end of the pendant is placed into the release hooks.

  On hoisting, the snap hooks slide down the fall and become fixed on the head of the cradle. The boat is thus guided back into the cradle, and hoisting back to the embarkation deck is achieved. The transfer of the boat to the launching pendant in the cradle is made at the davit head in a quick and simple procedure.

- The launch/recovery winch includes a centrifugal brake to maintain a constant lowering speed of 120 feet per minute when the craft is fully laden. (This speed can be increased to accommodate changes in regulations.) The main "fail safe" holding brake, which is operated by the helmsman from within the craft, can be used to stop descent of the craft at any point; he simply releases the brake control wire. Lowering is resumed when he again pulls the wire. This feature enables the helmsman to release the craft at the most opportune moment in the prevailing sea conditions and immediately steer away from the danger area at maximum speed.

- For shipyards, the big advantage is the ease of installation of the simple MIRANDA davit.

One of the most important features of the new davit is the fact that a MIRANDA operation does not require that any crewmembers remain on deck, descending later to the boat via a ladder or manrope. In an emergency, all personnel can exit the ship in the lifeboat together.

To date, the MIRANDA-type davit has been successfully used by the U.S. Navy, the Norwegian Navy, the German Navy, the Japanese Coast Guard, hydrographic and research vessels, chemical carriers, and tankers. ‡

Merchant Marine License Statistics Fiscal Year 1981

Merchant Marine Officer Licenses Issued

Deck

GRADE	ORIGINAL	RENEWAL
MASTER:		
Ocean	488	1,168
Coastwise	18	62
Great Lakes	21	65
Bays, sounds, and lakes	62	160
Rivers	45	114
Chief Mate:		
Ocean	233	196
Coastwise	2	8
Great Lakes	4	4
Bays, sounds, and lakes	17	21
Rivers	27	39
2nd Mate:		
Ocean	336	240
Coastwise	1	4
3rd Mate:		
Ocean	531	306
Coastwise	18	9
Pilots:		
Great Lakes	78	216
Bays, sounds and lakes	444	329
Rivers	221	276
Master (uninspected vessels)	549	337
Mate (uninspected vessels)	217	63
Motorboat Operator	4,878	3,233
Radio Officer	68	269
	8,258	7,119

GRAND TOTAL 15,377

Merchant Marine Officer Licenses Issued

Engineer

GRADE	ORIGINAL	RENEWAL
STEAM		
Chief Engineer:		
Unlimited	150	1,123
Limited	7	45
1st Assistant:		
Unlimited	216	356
Limited	2	18
2nd Assistant:		
Unlimited	384	613
Limited	0	4
3rd Assistant:		
Unlimited	650	834
Limited	3	8
	1,412	3,001
MOTOR		
Chief Engineer:		
Unlimited	188	348
Limited	32	224
1st Assistant:		
Unlimited	79	83
Limited	10	53
2nd Assistant:		
Unlimited	143	96
Limited	7	16
3rd Assistant:		
Unlimited	575	870
Limited	4	41
	1,038	1,731
Uninspected Vessels:		
Chief Engineer	234	151
Assistant	125	42
	359	193

GRAND TOTAL 7,734

Towboat Operators Licenses Issued

	CANDIDATES	PASSED
Operator	1,847	1,057
2nd Class Operator	665	438
Endorsements	247	210
	2,759	1,705

TOTAL LICENSES INCLUDING RENEWALS: 24,816

New Reports Available from Ship Structure Committee

The Ship Structure Committee recently published three new technical reports which are available free of charge:

SSC-300	"Summary of Nondestructive Inspection Standards for Heavy Section Castings, Forgings and Weldments" presents a survey of state-of-the-art techniques, methods, and practices being employed in the nondestructive examination of such vessel components as stem and stern frames, rudder horns, stern tubes, tailshafts, propellers, and engine parts.
SSC-301	"Probabilistic Structural Analysis of Ship Hull Longitudinal Strength" offers a computer program for the analysis of uncertainties associated with ship hull strength. Factors considered include control of material properties, tolerances, corrosion, and cracking.
SSC-302	"Computer-Aided Preliminary Ship Structural Design" is an evaluation of current trends in computer-aided design and their technical and economic impacts on preliminary structural design of ships. An extensive listing of existing programs is included.

For copies of these reports or further information contact LCDR David B. Anderson, Secretary, Ship Structure Committee, U.S. Coast Guard (G-MMT-4/13), Washington, DC 20593.

Chemical of the Month

Acetic Anhydride: $(CH_3CO)_2O$

(often abbreviated Ac_2O)

synonyms:	acetyl oxide acetic oxic ethanoic anhydride
Physical Properties	
boiling point:	140°C (284°F)
freezing point:	-73°C (-99°F)
Threshold Limit Values (TLV)	
time weighted average (TWA):	5 ppm or 20 mg/m^3
short term exposure limit (STEL):	none established
Combustion Properties	
flash point (cc):	49°C (120°F)
autoignition temperature:	390°C (734°F)
Flammability Limits in Air	
lower explosive limit (LEL):	2.9% vol.
upper explosive limit (UEL):	10.3% vol.
Densities	
liquid (water = 1.0):	1.08
vapor (air = 1.0):	3.5
Identifiers	
U.N. Number:	1715
CHRIS Code:	ACA

Acetic anhydride is a dangerously acidic, colorless liquid made from either acetone or acetic acid (the latter substance, in dilute solution, is vinegar). Production of acetic anhydride dates back to the middle of the nineteenth century. About 660,000 tons were produced in 1975, but production is now declining, and significant overcapacity exists in the industry. Ninety-five percent of all acetic anhydride is used in making such cellulose esters as cellulose acetate, a substance used as a photographic film base, a thermoplastic, and an ingredient in lacquer, among other things. Lesser quantities are used to make such products as aspirin (chemically speaking, aspirin is acetylsalicylic acid) and textile-sizing agents. The chemical is also used in electrolytic polishing of metals.

Acetic anhydride is a dangerous substance. Breathing acetic anhydride vapor can produce changes in blood chemistry and in the nervous system. The liquid penetrates the skin rapidly and results in painful burns and blisters. Chronic exposure causes dermatitis. Special care is needed in protecting sensitive tissues of the eyes, mouth, and nose. Low concentrations can result in acute irritation of the eyes. Protective measures for persons handling acetic anhydride range from gloves, masks, goggles, and face shields to impervious clothing, head covering, and protective footwear, depending on whether someone is merely in the vicinity of the chemical or working directly with it. Fortunately, the vapor has a penetrating, choking odor (it has been described as smelling like "pungent vinegar") and serves as an effective warning. Anyone who smells it should leave the area immediately or protect his eyes and respiratory system. First aid for injurious exposure consists of flushing any affected tissue with water for at least 15 minutes. Medical attention should be sought immediately.

Acetic anhydride is flammable and, in certain situations, can be explosive. The explosiveness is a result of the fact that acetic anhydride is an effective oxidizer (it reacts violently with many materials). Mixtures with nitric acid are particularly dangerous and are said to be more sensitive than nitroglycerine. Acetic anhydride vapor is denser than air and thus tends to accumulate in low places. The flash point (the temperature at which the chemical gives off a vapor sufficient to form an ignitable mixture with the air near its surface) is relatively low--49°C (120°F). Sources of ignition must thus be kept away from areas where vapor may collect. Water spray is probably the best means of controlling an acetic anhydride fire in the open or in an open container, but caution should be exercised with confined spaces such as tanks. Water reacts with acetic anhydride, causing it to decompose to acetic acid; a considerable amount of heat is generated in the process, so if water gets into an acetic anhydride tank, the pressure resulting from the chemical reaction could cause an explosive rupture. Acetic anhydride fires can be fought with carbon dioxide, dry chemical, or alcohol foam, in addition to water spray.

Because of its severe hazards, acetic anhydride is rated a Category C Pollutant by both the Environmental Protection Agency and the Inter-Governmental Maritime Consultative Organization. The Department of Transportation has designated it a corrosive material (because it is so corrosive, it must be carried in tanks made of aluminum, stainless steel, or steel covered with a protective lining or coating). The Coast Guard regulates the carriage of acetic anhydride by barge and ship in Subchapter O of the Code of Federal Regulations.

Alan Schneider, Sc.D., and Curtis Payne, B.A.
Hazard Evaluation Branch
Cargo and Hazardous Materials Division

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Lessons from Casualties

AMMONIA IS DEADLY

A recent fatality on a tuna seiner indicates a danger that may not be recognized by fishermen and others who work around refrigeration machinery.

During a repair and maintenance period in port, a member of the vessel's engineering department was cleaning a filter in the ammonia refrigeration system. The filter, which served to remove oil and particulates from the ammonia before it entered the condenser, was located downstream from the compressor. When the filter was removed from the system, it was placed in a bucket of water. In spite of the water, it gave off so much ammonia that people standing nearby had to back away. Neither the oiler cleaning the filter nor the chief engineer who had disassembled the system sensed any danger. Strong ammonia fumes were not thought to be unusual; those present knew where the breathing apparatus was stowed and had been told to use it or leave the space if necessary; the manufacturer's maintenance instructions including safety measures were being followed. For routine maintenance such as this, there was no recommendation for personnel to wear breathing apparatus. The oiler never finished cleaning the filter. He became ill and went to the head on the main deck. He complained of dizziness and difficulty breathing and was brought to the nurses' station, given oxygen, and then quickly taken to the hospital. Two hours after starting to clean the filter, he was dead.

In the report of the investigation, a senior Coast Guard Marine Safety Officer commented: "On every tuna fishing vessel I have been on board there were ammonia fumes. Every marine surveyor who works with the tuna fleet that I have talked to about these vessels says that ammonia fumes are ever present, in greater or lesser degree, on board. Since ammonia fumes are ever present in small degree, the crew learns to live with them. This is a case of living so close to a potential danger that it is not noticed when the danger creeps up until someone gets hurt." This probably applies to more than just tuna vessels, and it is frightening to think how many people are working right on the edge of serious injury or death every day.

SOME FACTS ABOUT AMMONIA

At room temperature and atmospheric pressure, ammonia is a gas. It can be liquefied relatively easily by cooling or pressurizing. This makes it very good for a refrigerant.

Ammonia dissolves in water very easily and is often used in this form. Both the aqueous solution and the gas (which can be given off by the aqueous solution) can be harmful.

Ammonia is a severe eye hazard and can cause serious injury within a very short time. Eye injuries constitute the most serious hazard of ammonia in terms of possible permanent disability. To prevent blindness, wash eyes with water immediately (seconds count, so carry emergency water); continue for 15 minutes. (For further details, consult National Institute for Occupational Safety and Health publication No. 74-136, "Criteria for a Recommended Standard—Occupational Exposure to Ammonia")

Ammonia can cause burns to the skin and do severe damage to the respiratory system. Destruction of the respiratory system is the usual cause of death in the case of exposure to high concentrations. Long-term or permanent damage can also occur.

The odor threshold (least detectable odor) of ammonia in air is in the range of 20 to 50 ppm (parts per million), depending on the sensitivity of the individual.

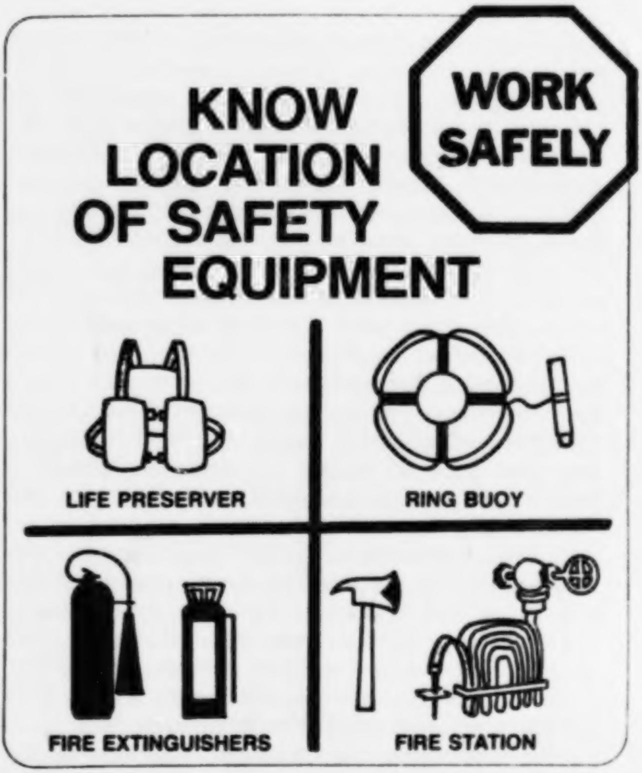
The best available information about the maximum safe limits for exposure to ammonia are the standards set by the American Conference of Governmental Industrial Hygienists (ACGIH) for the protection of workers from both chronic (long-time, low-concentration) and acute (short-time, high-concentration) exposure. The ACGIH recommends that workers be exposed to no more than an average of 25 ppm (0.0025%) for an 8-hour day in a 40-hour week. This is called the Threshold Limit Value - Time Weighted Average, and its purpose is to protect against the development of chronic illneses over an extended period of time. The maximum concentration to which a worker can be exposed for up to 15 minutes before experiencing irritation, irreversible tissue change, or impairment of judgment is 35 ppm (0.0035%). The short-term maximum of 35 ppm must not occur more than 4 times a day, and there must be one full hour between these exposures. Note that this standard does not apply to continuous exposure for full days as might occur on vessels.

Since calibrated instruments capable of calculating time-weighted averages are probably not available on most vessels, the above facts can be combined for a "rule of thumb": if you can smell ammonia, it has reached the maximum level normally allowable in the air. Short exposure to slightly higher levels is acceptable if offset by additional time in pure air. If irritation, burning or discomfort occurs, the concentration is too high. Leave or get out the breathing apparatus immediately. For even higher concentrations, a breathing apparatus is not enough; a full protective suit is needed to prevent burning of the skin.

Signs of irritation or health problems have been observed at the lower end of the range at which the odor of ammonia is detectable.

SPECIAL DANGER ON VESSELS

Shore-based industries are advised to store ammonia outside, clean equipment outdoors, and maintain good ventilation under all circumstances. Frequently, this is not possible on vessels, particularly where the systems are all below deck. In the confined spaces on vessels, all but the most minor releases of ammonia almost automatically become life-threatening events. ⟂



THE AMERICAN WATERWAYS OPERATORS, INC.

AMVER: Computer-assisted Search and Rescue

by LTjg Nancy H. Ross
Chief of Maritime Relations
Atlantic Area Information Systems Division

Two computers cannot physically provide aid to mariners in distress around the world. They can, however, store and allow operators to retrieve the information which makes such assistance possible. AMVER, the Coast Guard's Automated Mutual-assistance VEssel Rescue system, is set up for expressly that purpose. Ships of more than 80 nations voluntarily participate in AMVER by sending their sail plans, periodic position reports, and such information as whether they have a doctor on board to the AMVER Center on Governors Island, New York. By predicting the positions of merchant vessels near the scene of an emergency, AMVER can help rescue agencies determine which vessels are best able to assist. In addition, should a participating ship need assistance, rescuers can more easily determine a search area based on AMVER information. Ships' positions are divulged only to authorized rescue agencies for use in an emergency. There is no cost for participating in the system, and nearly 100 cooperating radio stations send the ships' reports to New York free of charge. More than 2,200 vessels are on plot on any given day.

To centralize its computer operations, the Coast Guard is presently refurbishing the AMVER Center on Governors Island and creating an Operations Computer Center. The two computers mentioned above are the heart of this facility, which is administered by the Atlantic Area Information Systems Division.

The two Prime 750 mini-computers were purchased in January 1980. They were installed the following April after the AMVER Center was remodeled slightly to accommodate them. The complete renovation of the center was begun in July 1981 and is scheduled for completion later this year.

The changes underway at AMVER are only the latest in a series that has gradually broadened and improved AMVER's capabilities. AMVER began in 1958 as a hand-calculated plot of vessels in the Coast Guard's Atlantic Ocean area of search-and-rescue responsibility. The plotting was computerized that same year, and in 1960 the area covered was extended to longitude 15 W, still in the North Atlantic.

AMVER was expanded to the Prime Meridian in 1963 and to the North Sea, Mediterranean Sea, and South Atlantic in 1964. The Pacific Ocean was included in 1965 after the purchase of a new computer. At present, the system relies on the Department of Transportation Computer Center in Washington, DC, to which data is transmitted by phone line from New York. After its completion, the new center on Governors Island will become the focal point of computer support for both AMVER and other Coast Guard operations.

The missions of the new Operations Computer Center (OCC) will include several additional marine and port safety functions. Among these is maintaining data for the extensive

Marine Safety Information System (MSIS). Two Prime computers now in Ohio for development of MSIS are scheduled to be moved to Governors Island to handle that system exclusively.

Although the various missions will all come under the OCC's umbrella, not all users will have access to all data. For example, stringent measures will ensure that AMVER data remains available only to search and rescue agencies.

The OCC will coordinate data that applies to more than one Coast Guard mission. This will eliminate duplication in the collection and dissemination of data related to the same incident—for example, a collision between two ships that makes a rescue operation necessary and also pollutes the waterway. The goal of the system is to provide better computer support for all missions of the OCC.

Each of the Prime computers has a storage capacity of several hundred million characters, or bytes. In both storage capacity and computing speed, the Primes exceed the Department of Transportation computer now used by AMVER. The larger capacity will enable operators to plot a greater number of vessels and do a more sophisticated analysis of search planning problems. The increased computing speed will enable them to more rapidly retrieve AMVER information in an emergency.

The Information Systems Division's programmers have been testing and learning about the new computers since installation of the equipment in 1980. Data and programs are gradually being transferred from the Department of Transportation computer to the OCC. The transfer is scheduled for completion by July 1982. Last year the plotting of icebergs for the International Ice Patrol (a task assumed by the Division in 1970) was done on the Primes after the data was converted from the form used in the Department of Transportation computer.

AMVER's goal is to help rescue agencies see that those vessels best able to assist come to the aid of vessels in trouble.

A network of terminals linking Coast Guard District rescue coordination centers to the computers has been established, and all Districts except two have rented one or two terminals. Eventually standard terminals will be purchased and installed throughout the service at many commands.

Unlike the present cumbersome communications link, which relies heavily on teletypes for the transmission of data, the terminals allow users to "converse" with the computer by entering various commands on the terminal's keyboard. The computer's replies are displayed on the terminal's video screen almost immediately.

A printer may be used in conjunction with the terminal to print out information to be retained. This will eventually include graphic AMVER "surface pictures," chart overlays showing the predicted positions of participating ships. The "surface pictures" produced by the present system are actually lists of ships and their positions.

The new system will also allow operators to enter AMVER messages directly into the computer without rewriting them, as they must under the old system. A new format for the messages will be devised to make use of this capacity. Every effort is being made to design a format that can be easily read by both the ship's officers and the computer.

In January 1980 more than 40 representatives from Coast Guard Headquarters and 11 of the 12 Districts came to Governors Island to learn how to use the terminals and programs. Those who attended the five-day session in the AMVER Center theater learned how to work with some of the computer's available languages, how to write simple programs, and how to use INFO, a sophisticated computerized filing and retrieval system purchased for the Primes. INFO allows rapid access to the computers' data.

Students who attended the course are now able to write programs for local application. Those that have been written so far include the

The computers' data is stored in disk packs.

The operator loads a magnetic tape onto one of the two Prime computers. Tapes can be used to transfer data from one computer to another or to store data no longer needed on the disk pack.

updating of the Third District's aids to navigation records, inventory control for scientific equipment aboard ships in the Pacific Area, the maintaining of fixed-gear fishing records in the Atlantic Area, and operational cost computations in the Fifth District.

When completed, the new Operations Computer Center will both improve AMVER and enable the Coast Guard's Atlantic Area Information Sytems Division to better carry out its other missions. The Coast Guard's computer operations are being centralized;the assistance made possible by those operations will continue to extend worldwide. ⚓

* * * * *

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. Serving is

A. marline or ratline wound along the grooves of a rope.
B. narrow strips of light canvas or cotton cloth spiral-wrapped along the rope.
C. marline tightly wound on the rope by means of a board.
D. a splice made by laying the strands of one rope in the vacated grooves of another rope.

REFERENCE: Knights

2. In areas where CO_2 piping is installed, such piping may not be used for any purpose except

A. in connection with the fire-detecting system.
B. in connection with the water sprinkler system.
C. to ventilate the space.
D. to run the emergency wiring to the space.

REFERENCE: 46 CFR 95.15-15(h)

3. A Loran-C receiver in operation first receives pulses from the

A. slave station.
B. master station.
C. multiple stations.
D. secondary station.

REFERENCE: Dutton's

4. What type of cargo venting is permitted on a tanker which carries Grade B petroleum products?

I. Branch vent lines from each cargo tank connected to a vent header
II. Individual pressure-vacuum relief valves at each cargo tank
III. Gooseneck vents and flame screens at each cargo tank

A. I and II only
B. I and III only
C. II and III only
D. I, II, and III

REFERENCE: 46 CFR 32.55-20

5. Lighted ranges located along a navigable channel may be used to mark

A. shoals and obstructions in a channel.
B. turning points in a channel.
C. anchorages in a channel.
D. restricted areas in a channel.

REFERENCE: Dutton's

ENGINEER

1. The solenoid valves in the fuel supply line of an automatically-fired auxiliary boiler are automatically closed by

A. a decrease in feed temperature.
B. high furnace air pressure.
C. high steam pressure.
D. low steam pressure.

REFERENCE: 46 CFR 63.05-30.10-30

2. Where two-stage air ejectors are used in a two-stage flash evaporator, the first-stage air ejector takes suction from the second effect of the evaporator, and the second-stage air ejector

A. takes suction from the first effect.
B. takes suction from the second effect also.
C. takes suction from the first-stage air ejector outlet.
D. is normally idle and used mainly as a standby unit.

REFERENCE: Harrington

3. A relatively constant pressure is maintained in the potable water system of many ships by using

A. constant speed supply pumps.
B. variable speed supply pumps.
C. an air cushion in the pressure tanks.
D. a pressure regulator in the pressure tank discharge piping.

REFERENCE: M.E.B.A. Training Manual

4. The breathing bag of a canister-type oxygen breathing apparatus is used to store

A. exhaled CO_2 until the canister chemicals can begin the oxygen-making process.
B. generated oxygen, which is created faster than the wearer can use it.
C. generated oxygen, accumulated so that the wearer may replace cartridges without leaving the space.
D. exhaled CO_2 which has been separated from the exhaled moisture by the cartridge chemicals.

REFERENCE: Marine Fire Prevention, Fire-fighting and Fire-safety

5. What poisonous gas is most likely to be found in a closed compartment that is on fire?

A. Nitrogen
B. Hydrogen
C. Carbon dioxide
d. Carbon monoxide

REFERENCE: Marine Fire Prevention, Fire-fighting and Fire-safety

ANSWERS

DECK
1.C;2.A;3.B;4.A;5.B
ENGINEER
1.C;2.C;3.C;4.B;5.D

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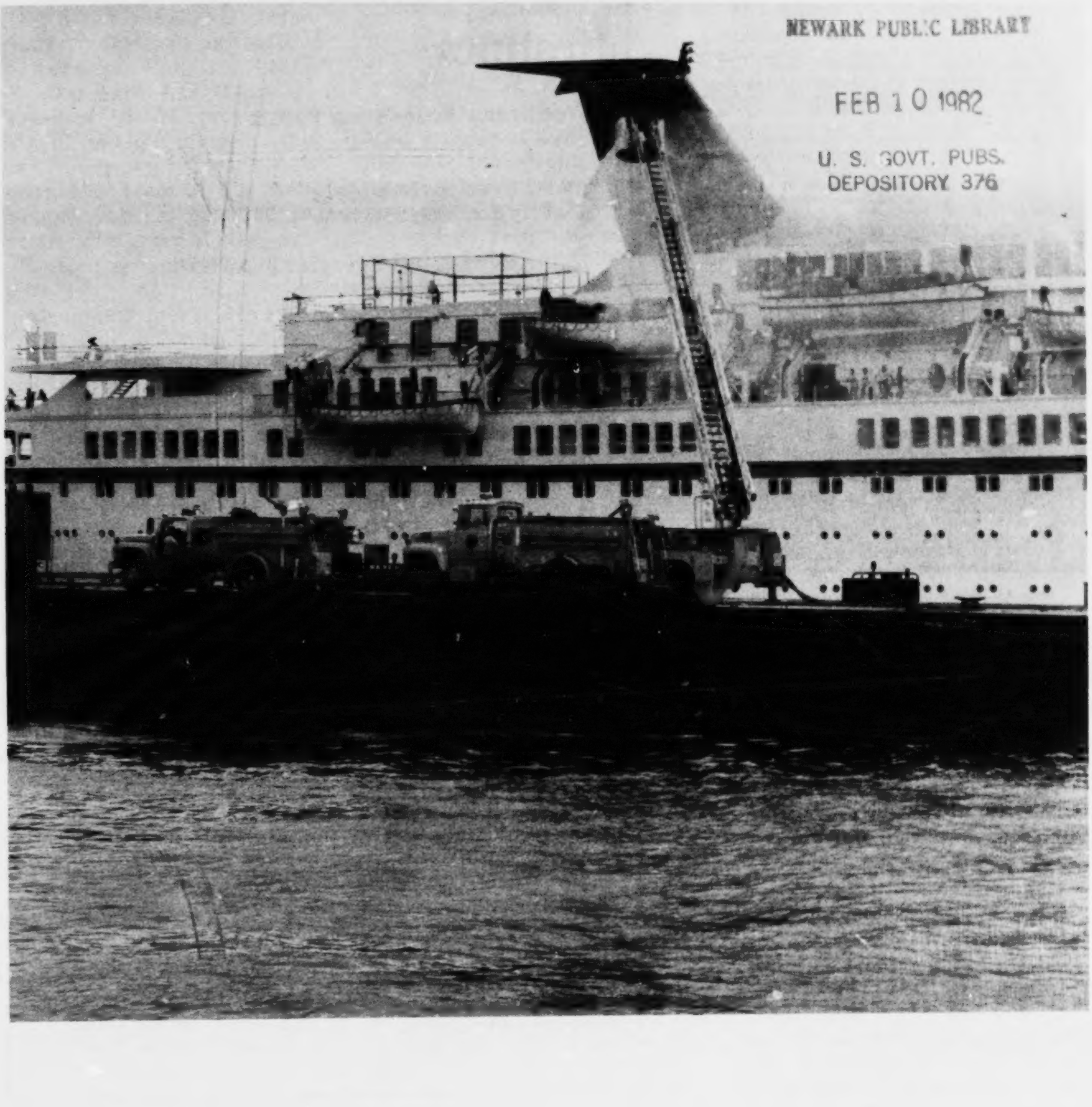

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Proceedings
of the Marine Safety Council

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Commandant

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cover

Emergencies such as the explosion of a bomb on board a ship in port often require coordinated action by a number of rescue agencies. The firefighters shown here (whose trucks are on a barge alongside the ship) are just one of the groups involved in the Puerto Rican Maritime Emergency Response Plan. For more on this plan, which was developed by the Coast Guard, State Civil Defense, and local agencies, see the article beginning on page 43.

Maritime Sidelights

Coast Guard Initiates Direct Commission Program

The Coast Guard has a continuing need for personnel familiar with the merchant marine industry. Although two existing programs, Maritime Academy Graduate and Licensed Officer of the Merchant Marine, fill part of its needs, the new program, Experienced Licensed Officers of the Merchant Marine, is directed at persons who exceed the age limit for the existing programs.

Applicants who are appointed will serve as inspectors, investigators, and as licensing program personnel in Coast Guard field offices. They will be required to serve a minimum of five years on active duty.

Applicants must be U.S. citizens between the ages of 38 and 57. They must be able to meet the physical requirements for a direct commission in the Coast Guard Reserve and those established for retention standards for Coast Guard personnel. They must also be holders of a license authorizing service on inspected vessels and meet one of the following license and service requirements:

1) Master Oceans, any gross tons—no service
2) Master (other)—6 months as Master
3) Chief Mate Oceans, any gross tons—6 months as Chief Mate
4) Chief Mate (other)—12 months as Chief Mate
5) Pilot, over 1600 gross tons—24 months as a Pilot
6) Chief Engineer, over 4000 HP—no service
7) First-Assistant Engineer, over 4000 HP—6 months as First-Assistant.

Waivers of the eligibility requirements will be considered for candidates who have had marine inspector or surveyor experience in the maritime industry.

In this program, as in all recruiting programs, the Coast Guard goal is to achieve a recruiting rate of 18 percent minority personnel.

Further details and application forms can be obtained by contacting U.S. Coast Guard (G-PMR-1), Washington, DC 20593; (202) 426-1370.

Conference Program Announced for National Maritime Show

The National Maritime Show is scheduled to be held in the new Baltimore Convention Center in Baltimore, Maryland, from March 9 - 11, 1982.

In addition to the more than 200 companies that will be represented at the technical exhibits, a program of conference sessions will be held in conjunction with the show. These conference sessions are being sponsored by Lloyds of London Press and Marine Engineering/Log.

Lloyds of London Press will be sponsoring four sessions on management and financial affairs: 1) Shipping Economics, 2) Market Forces, 3) Marine Insurance, and 4) Maritime Law.

Marine Engineering/Log will be sponsoring four sessions on technical and engineering matters: 1) Marine Propulsion Systems: Engine Options for the Future, 2) Coping with High-cost/low-quality Marine Fuels, 3) Training and Manning for the Electronic Age in Shipping, and 4) Electronics on the Bridge.

Further details on the exhibition or conferences can be obtained by contacting:

Peter K. Johnson
National Maritime Show
10703A Stancliff St.
Houston, TX 77099
Tel.: (713) 879-8929

Seabee Calendar—1982

The Seabee Memorial Scholarship Association recently announced the availability of its 1982 calendar. The theme of the calendar is "Pride, Professionalism, and Patriotism," illustrated with color photographs and original artwork. Copies can be ordered for $3.00 plus $.75 for postage and handling from: Seabee Memorial Scholarship Association, Inc., P.O. Box 37229, Washington, DC 20013.

Great Lakes Transportation Publication Available

An inventory of American commercial shipping vessels used in ocean trade and on inland waterways is compiled and published annually in a three-part series by the

Waterborne Commerce Statistics Center of the U.S. Army Corps of Engineers' Water Resources Support Center.

The center announced recently that the 28-page 1980 edition of Transportation Series 3, "Transportation Lines on the Great Lakes System," is available and may be purchased for $1.00 from the New Orleans Engineer District LMNED-S, P.O. Box 60267, New Orleans, LA 70160. Other parts of the series will become available in the near future.

(Reprinted from the November 1, 1981, issue of Maritime Reporter and Engineering News)

LSU Prepares Guide to Lower Mississippi

The Louisiana State University Center for Wetland Resources recently published the 1981 *Marine Atlas & Service Guide to the Lower Mississippi River: Baton Rouge to the Gulf of Mexico*. This volume is a compilation of information on:

- Operations: barge fleeting, midstream cargo transfer, and ferries,
- Facilities: achorages, docks, terminals, mooring locations, warehouses, and off-river installations,
- Services: launches, midstream suppliers, shipyards and repair, and tugboats,
- Structures: bridges, locks, revetments, and utility crossings,
- Agencies: levee boards and miscellaneous telephone numbers, and
- Maps: color maps showing locations of anchorages, barge fleeting, bridges, ferries, docks, terminals, mooring locations, warehouses, and revetments.

Copies are available for $25 each. Payment (checks should be payable to Marine Atlas) must be enclosed with order. Orders should be sent to:

Marine Atlas & Service Guide
Center for Wetland Resources
Louisiana State University
Baton Rouge, LA 70803

For further information, call Lee Patterson, (504) 388-1558.

News from MarAd

The Maritime Administration has entered into an agreement with the Marine Exchange of the San Francisco Bay Region to develop and demonstrate a computerized system which would track and, in an emergency, could provide the location of all ships in or scheduled to arrive or depart U.S. ports. The management information system would support a nationwide vessel in-port locator system known as VIPLOC. By storing data on vessels, it would aid MarAd in deciding how to utilize ship resources at the start of a national emergency. The project is expected to be completed by June 30, 1982.

The President has announced a program to reduce new Federal loan guarantee commitments for Fiscal Year 1982 by $20.3 billion, including $225 million in the Title XI program administered by MarAd. The ceiling for the current fiscal year on merchant ship financing guarantees had been $900 million. The President's proposed action would reduce the MarAd ceiling to $675 million, with cuts to be achieved primarily by eliminating new loan guarantees and commitments for liquefied natural gas (LNG) carriers and oil drilling rigs.

MarAd recently announced publication of an update of its semi-annual "Vessel Inventory Report." This report, which contains information on all U.S.-registered oceangoing merchant ships of 1,000 gross tons and over as of June 30, 1981, lists merchant ships alphabetically by name and owner or operator. It also includes information on National Defense Reserve Fleet sites and vessels. Copies of the report are available from the Maritime Administration Public Affairs Office, U.S. Department of Transportation, Washington, DC 20590.

Also available from that office is the recently released report "Estimated Vessel Operating Expenses." This booklet contains estimated expenses as of July 1980 for 41 vessels of various types selected to represent a cross-section of the U.S.-flag merchant fleet. The report is divided into four sections: 1) modern vessels of the breakbulk, containership, barge carrying, tanker, and dry-bulk carrier designs, 2) oceangoing vessels constructed during World War II of the breakbulk, tanker, bulk carrier, and lift-on/lift-off vehicle carrier design, 3) coastwise tugs, offshore tug/supply vessels, and inland towboats, and 4) Great Lakes bulk carriers. These data are intended for broad-based estimating only and should not be used for ratemaking purposes. ‡

Keynotes

The following items of general interest were published between November 19, 1981, and December 14, 1981:

Final rule: CGD 80-091 Drawbridge Operation Regulations; Milwaukee, Menomonee, and Kinnickinnic Rivers and South Menomonee and Burnham Canals, Wisconsin, December 10, 1981.

Notices of proposed rulemaking (NPRMs): CGD 5-81-09R Drawbridge Operation Regulations; Anacostia River, Washington, District of Columbia, December 7, 1981. CGD 81-071 Drawbridge Operation Regulations; Little Potato Slough, California, December 10, 1981.

Notices: CGD 81-091 Notice of Intent to Prepare an Environmental Impact Statement for Proposed South Bronx-Oak Point Link Project, Harlem River, Bronx County, New York, December 3, 1981. CGD 81-007 Notice of public hearing on Inland Navigation Rules; Annex IV—Distress Signals, December 7, 1981. CGD 81-093 Notice of Study Results for Port Access Route Study, Thirteenth Coast Guard District, December 7, 1981. CGD 81-094 Notice of Study Results for Port Access Route Study, Coast of Alaska, December 14, 1981. CGD 81-095 Environmental Impact Statement for Proposed Bridge Construction Across Garrison Channel at Harbor Island, Tampa, Hillsborough County, Florida, December 14, 1981.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Is it a Bridge or a Boat?

You are navigating a river when you hear three short blasts of a whistle. Being thoroughly familiar with the Rules of the Road, you recognize immediately that it is a vessel using reverse propulsion, backing down. But wait--you also remember that there is a drawbridge in the vicinity, a drawbridge with an opening signal of three short blasts. Which is the correct interpretation of this whistle signal?

To eliminate confusion between drawbridge opening signals and signals with other meanings, the Coast Guard has adopted regulations which prescribe the opening signal to be used by vessels when they approach a drawbridge. The ship approaching the bridge shall sound a signal of one long blast followed by one short blast. Should the bridgetender be ready and able to open the draw, he will sound a signal of one long and one short blast also. The one long and one short signal does not coincide with any other signals currently in effect. Should the situation arise that the draw cannot be opened or must be closed immediately, the bridgetender will sound four short blasts—the accepted danger signal. Visual signals will also be standardized. A white flag by day and a white light by night will indicate a request for a draw opening and an acknowledgment signal, and a red flag and red light will signal that the draw cannot be opened or must be closed immediately. In areas where there are many drawbridges in close proximity to each other, different signals will apply, depending on the area.

This final rule, titled "Drawbridge Operation Regulations; Opening Signals for Drawbridges" (CGD 75-237), was published on December 3, 1981, and will take effect on February 8, 1982.

Revision Proposed for Regulations on Marking of Obstructions

The Coast Guard is proposing to revise the regulations which govern the marking of structures, offshore thermal energy conversion (OTEC) facilities, sunken vessels, and other obstructions. The proposed revisions are a result of changes in the law governing Coast Guard authority to mark obstructions and are intended to eliminate redundancy and make the regulations easier to understand.

An NPRM was published on November 19, 1981 (CGD 78-156), detailing the changes in the law which extend the jurisdiction of the Coast Guard beyond the present 12-mile territorial waters limit to include the waters over the continental shelf. Under the proposed rules, obstructions in that area (with certain exceptions, such as bridges or dredges) will have to be marked by the owner with a buoy or daymark and a light. Obstructions not properly marked by the owner will be marked by the Coast Guard at the owner's expense. Any obstruction requiring marking must be reported to the Coast Guard, and the type of marking must be approved.

For further information contact LT Walter L. Johnson, Short Range Aids to Navigation Division (G-NSR), U.S. Coast Guard, Washington, DC 20593; (202) 426-1974.

Coast Guard Requests Comments on Impact of Regulations

The Coast Guard is reviewing regulations that have a significant impact on small entities, such as small businesses, small organizations, and small governmental jurisdictions. An entity with fewer than 500 full-time employees or a governmental jurisdiction with fewer than 50,000 people can generally be considered "small." Gross sales (the levels to be determined according to the industry) can also be a qualifying factor.

The Coast Guard is going through the sections of the Code of Federal Regulations (CFR) containing Coast Guard regulations to determine which regulations have the most significant impact and should be reviewed first. The assistance of the public is requested for this screening process. Comments, especially those from small entities, are invited from persons who have experienced the impact of regulations firsthand.

In a notice published December 7, 1981 titled "Regulatory Flexibility Act Review of Coast Guard Rules and Regulations" (CGD 81-089), the Coast Guard requested that each person or organization commenting on this notice 1) cite the CFR Title and Part number for the regulations discussed, 2) describe the effects of the regulation on small entities, 3) identify those effects the commenter feels have a disproportionately heavy impact on small, as opposed to large, entities, and 4) recommend any changes the commenter feels would improve the regulations. The Coast Guard is currently using the CFR Part as a unit of review. Any suggestions for a different unit of review or any additional pertinent comments or data will also be welcomed. Comments should be submitted by April 6, 1982, to: Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593.

CTAC Seeking Members

The U.S. Coast Guard is seeking applicants for appointment to membership on the Chemical Transportation Advisory Committee (CTAC). This committee advises the Marine Safety Council on measures promoting safety in the transportation of hazardous materials on vessels, the transfer of these materials between the vessels and shore, and the use of waterfront facilities.

The committee usually meets at least once a year and holds subcommittee meetings on specific problems as necessary. Members are not paid by the Government and receive neither travel nor per diem allowances.

Selection will be based on expertise in the subjects covered. To achieve the balance of membership required by the Federal Advisory Committee Act, the Coast Guard is actively soliciting applications from minorities, women, and public interest representatives.

An alternate may be selected for each member appointed to the committee. If a prospective member chooses to select an alternate, an application for alternate membership for that person should be included with the application for membership.

Application forms can be obtained by writing to: Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593. The deadline for receipt of applications is February 20, 1982.

For further information contact Mary Williams, Hazardous Materials Division (G-MHM), U.S. Coast Guard, Washington, DC 20593; (202) 426-2306.

Actions of the Marine Safety Council

December Meeting

The Council approved for publication the following NPRMs:

CGD 81-023 Equipment Requirements for Recreational Boats; Personal Flotation Devices

This NPRM will change Parts 175 and 181 of Title 33 of the Code of Federal Regulations (33 CFR 175 and 181) by revoking an obsolete rule and making editorial changes concerning personal flotation devices (PFDs). It will also clarify the PFD carriage requirements.

CGD 81-038A Visual Distress Signal Equipment Requirements

This notice, modifying 33 CFR 175, will clarify confusing language concerning the number and type of visual distress signals that must be carried on recreational boats and the waters on which they are required. A second change is the replacement of a grandfather clause for existing flare launchers with a permanent exemption to be granted in certain cases.

Also approved by the Council were the following work plans:

CGD 81-088 Great Lakes Pilotage Regulations

This project would increase the present U.S. pilotage rates by approximately 10 percent. The increase is the result of a recently concluded agreement with the Canadian Great Lakes Pilotage Authority. An NPRM will be published in sufficient time to permit a final rule to become effective by April 1. As a sidenote, it is understood that the Canadian Great Lakes Pilotage Authority is planning to increase its rates in all Canadian areas (Welland Canal and the Cornwall District) by 14.75 percent.

CGD 81-090 Implementation of SOLAS 74

The International Convention for the Safety of Life at Sea, 1974, signed in London on November 1, 1974, entered into force for the United States on May 25, 1980. This project carries out the mandates of Executive Order 12234 of September 3, 1980 (Enforcement of the Convention for the Safety of Life at Sea), which directs the Coast Guard to promulgate regulations for implementation of the Convention. In addition to editorial changes throughout Title 46 of the CFR, rules will be developed to implement the new requirements for Lifesaving Equipment, Fire Protection Equipment, and Ship Control and Operations. An NPRM is scheduled to be published in April.

CGD 81-092 Miscellaneous Amendments to Electrical and Fuel System Regulations for Recreational Boats

As a result of regulatory reviews carried out under Executive Order 12291, it has been determined that many sections of 33 CFR 183 (Subparts I and J) are no longer necessary or do nothing to significantly improve boating safety. This project proposes to eliminate such sections. The schedule calls for an NPRM to be submitted to the Federal Register in May.

If you are on the mailing list for Navigation and Vessel Inspection Circulars (NVCs) and 1) wish to be dropped, 2) wish to change the number of copies you are receiving, or 3) have a change of address, please notify Commandant (G-MP-4/14), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-2163.

Retro-reflective Material Adds Extra Safety Measure to PFDs

Although federal regulations require only Type I personal flotation devices (PFDs) to have retro-reflective surfaces for better night visibility, it may be something that should be considered for other PFDs as an extra safety feature, according to Norman Lemley, Chief of the Survival Systems Branch of the Coast Guard's Office of Merchant Marine Safety.

Retro-reflective material has been used in recent years to provide better visibility on all kinds of items: children's clothing, truck bumpers, highway signs, bicycle tires, and even Halloween costumes. Its purpose is to reflect a high percentage of the light shone on it, giving the material a glowing effect against a background of darkness. This reflection is a highly desirable feature for a PFD if the wearer might be searched for at night. It can make him as much as ten times more visible to rescuers and greatly increase his chances of being seen, according to tests conducted by 3M Company and the Coast Guard.

A safety-conscious recreational boater may want to consider putting retro-reflective tape on all PFDs aboard if any cruising is done at night. This has two advantages. First, it makes everyone on deck who is wearing a PFD more conspicuous and easier to keep track of. This could save time and maybe a life by hastening the realization that someone is missing. Second, the most obvious advantage is the increased chance of finding the missing person once a man overboard search has begun.

Mr. Lemley warned those considering putting retro-reflective tape on their PFDs to carefully follow manufacturer's instructions for application of the tape and to avoid sewing the tape to the PFD. The hazard in sewing anything to a PFD is the chance of puncturing the sealed flotation packages in the PFD, thereby rendering it useless.

Port Access Route Study Update

by Christopher Young
Navigation Rules and Information Branch
Short Range Aids to Navigation Division

The Coast Guard has begun publishing the results of the Port Access Route Study in the Federal Register. As described in an earlier article (see the August 1981 issue of the Proceedings), the Coast Guard is obligated under the Ports and Waterways Safety Act to study the need for designated routing measures in the offshore approaches to U.S. ports. As each District office completes the study of its area, a report of the results is being published in the Federal Register. When a report recommends a new routing measure, it will be followed by a notice of proposed rulemaking (NPRM).

The completed study will involve nine reports, of which five have thus far been published. The results for the area of the Florida peninsula were published in the Federal Register on October 1, 1981. The report for the area of New York and Delaware Bay approaches was published on October 5, 1981. The report for the Gulf of Mexico was published on October 8, 1981. The study of the area which includes the coast of Washington and Oregon was reported on December 7, 1981, and the report for Alaska was published on December 14, 1981.

The results for the remaining study areas will be published within the next few months.

Two of the five published reports have made recommendations for routing measures and rulemaking, of which the following are highlights:

As indicated in the Keynotes section of the January 1982 issue of the Proceedings, the **Eighth District** report for the Gulf of Mexico makes several recommendations:

1) new fairway anchorages at Sabine Bank and Calcasieu Pass/Lake Charles;

2) an expanded fairway at Southwest Pass;

3) a new fairway at the entrance channel to Lower Mud Lake; and

4) new precautionary areas and a traffic separation scheme (TSS) for the approach for Galveston Bay.

The **Seventeenth District** report for the coast of Alaska makes two recommendations:

1) a new fairway arrangement in the approach to Prince William Sound; and

2) a new fairway through Unimak Pass.

Regulations will be required to implement the proposed shipping safety fairways and anchorages. Establishment of the TSS will also require application to the Inter-Governmental Maritime Consultative Organization (IMCO) for adoption and international recognition.

Details of the above recommendations can be found in the appropriate issues of the Federal Register. They are also available from Coast Guard Headquarters at the address listed below.

Although results for the remaining study areas will not be final until published, preliminary reports indicate that minor modifications and an extension of existing traffic separation schemes will be proposed for the California coast.

Further information on the Port Access Route Study can be obtained by contacting the author of this article at U.S. Coast Guard Headquarters (G-NSR-3), 2100 Second St. SW, Washington, DC 20593; (202) 426-4958. ⚓

AWSC Develops Shipyard Safety Training Program

The shipbuilding and ship repair industry ranks eighth nationwide in the incidence of lost workday injuries. Most of these injuries involve new employees. Finding that existing training programs were not geared to shipyard work and that many safety supervisors in smaller shipyards had little or no training expertise, the American Waterways Shipyard Conference recently launched "Operation CATFISH": Careful Attention to Factors Involving Safety and Health. The shrewd catfish, besides lending his name to the acronym, serves as a model for employees, since he survives by using his wits to overcome the hazards in his environment.

Operation CATFISH, otherwise known as the New Employee Shipyard Safety Training program, aims to prevent accidents by focusing employees' attention on safety and health hazards. After completing the program, employees should be able to:

- Recognize principal shipyard hazards.
- Demonstrate basic safety requirements to protect themselves from these hazards.
- Explain why certain safety requirements

The AWSC found that existing safety programs were not geared to shipyard workers, who face special health and safety hazards.

are necessary.

- Describe and meet their safety responsibilities.

The AWSC has developed a step-by-step guide for shipyard management. The "Training Administration Manual" is designed to enable even those with no teaching experience to administer the program easily. The guide begins with a summary of the benefits to be gained by instituting a safety and health program and suggestions for how management can demonstrate its commitment and support to safety and health in general. Among the latter are:

- Drafting a safety and health policy statement
- Appointing a safety and health representative who will be responsible for disseminating safety and health information within the facility
- Conducting regular facility inspections to uncover and correct safety and health hazards (employees should participate in these)
- Holding scheduled safety meetings
- Giving new employees proper training in safe work practices
- Providing a safety and health handbook or list of facility safety and health rules
- Investigating employee injuries, illnesses, and near-miss accidents to determine why they occurred, how to prevent a similar occurrence in the future, and what corrective action should be taken
- Maintaining records of injuries and illnesses

The chapter "Before Training" contains everything from guidelines for determining the needs of a specific shipyard's employees to pointers on scheduling the sessions and setting up the facilities. "During Training" goes on to discuss how the material can best be presented. The AWSC has prepared a "canned" slide/cassette presentation, but substitute slides of a shipyard's own workers and worksites can be inserted and the course thus tailored to any particular shipyard. Suggestions are also offered for supplementing the course, emphasizing certain areas, stimulating discussion, and using quizzes given before and after training to evaluate the effectiveness of the program (a sample quiz is included). "After Training" concludes this section with tips for following up on suggested improvements in the course and checking employees' retention of material by conducting worksite walk-throughs.

The slide/cassette show begins by explaining to new employees why they will benefit from a safety training program: by becoming aware of safety and health hazards, they can help prevent accidents and reduce their chances of job-related injuries or illnesses. The training program concentrates on seven basic areas:

- Personal protective equipment
- Good housekeeping
- Proper use of tools and equipment
- Safe practices for materials handling
- Proper procedures for entering confined spaces
- Electrical safety
- Taking responsibility for being a safe worker

The American Waterways Shipyard Conference (AWSC) was organized as part of the American Waterways Operators, Inc. (AWO), in 1976 to address the problems of our nation's small and medium-sized shipyards. The more than 300 such shipyards located on the East, West, and Gulf Coasts and the Great Lakes and Western rivers are responsible for building and repairing the tugboats, towboats, and barges for the country's domestic water transportation industry, the supply boats, crewboats, and other specialized vessels for the offshore service industry, and the vessels used in the fishing industry.

Six committees have been established within the organization to act on matters ranging from improving labor relations to working toward industry self-regulation. "Operation CATFISH" was developed by the Shipyard Safety Committee under a "New Directions" grant from the Occupational Safety and Health Administration.

The AWSC is now implementing "CATFISH" and producing additional shipyard safety training programs. AWSC's goal is to become a center of competency for safety and health programs in the shipyard industry.

Each of these areas is discussed first in broad terms, then in greater detail.

In the section **"Personal Protective Equipment,"** the importance of wearing hard hats, face shields, safety glasses, gloves, and, for some workers, special suits and helmets, respirators, safety belts, lifelines, and life jackets is emphasized.

"Housekeeping" includes pointers on keeping work areas clean and orderly, removing combustibles from around hot work, and keeping scaffolds clear, as well as a warning about placing heavy objects on hoses or cables and a reminder to keep stairs and walkways clear.

"Tools and Equipment" cautions workers to keep guards in place, use grounded plugs and cords, and inspect tools for defects.

"Materials Handling" includes guidelines for lifting, instructions for using hand signals and the proper rigging, and a warning to stay away from suspended loads.

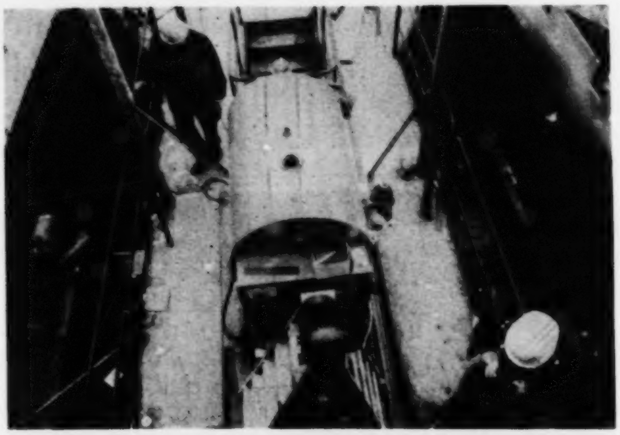
Among the safe work practices discussed in **"Confined Spaces"** are testing for oxygen and combustible gas, inspecting hoses and torches, making sure electrical equipment is insulated, grounded, and bonded, shutting off oxygen and fuel gas hoses during breaks and removing them from the confined space, and removing hoses and torches at the end of each shift.

"Electrical Safety" stresses the importance of keeping cables and plug boxes away from wet areas, reporting damaged cables, plug boxes, or lights, and inspecting tools and cables for damage.

Finally, **"Employee Responsibilities"** impresses on the workers the fact that each of them is responsible for seeing that the shipyard is a safe place to work and that all of the other employees are counting on them to do their part.

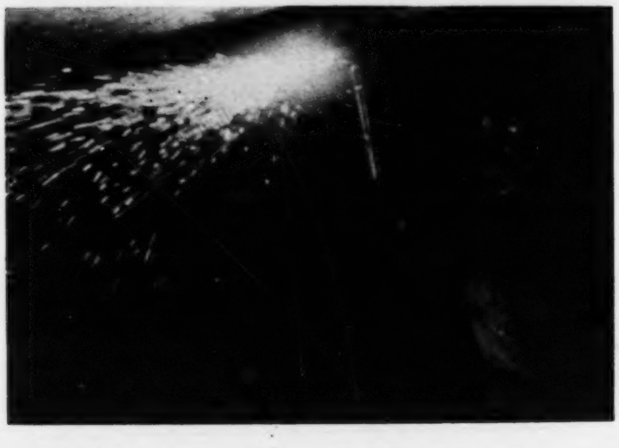
The slide/cassette show concludes with reminders of the importance of recognizing, reporting, and remedying hazards, reading directions, and reporting and attending to injuries.

Some excerpts from the section on housekeeping will serve to illustrate how the AWSC presents its points:



"Keep your work area clean and orderly.

"Clutter on the worksite is an invitation to slip or trip and fall. Arrange your equipment and materials so they are convenient to use but out of the way of others. Be especially careful with hoses and cables, and clean up any mess or spill as you go along. You will find that these work practices make your job easier and more comfortable, as well as safer.



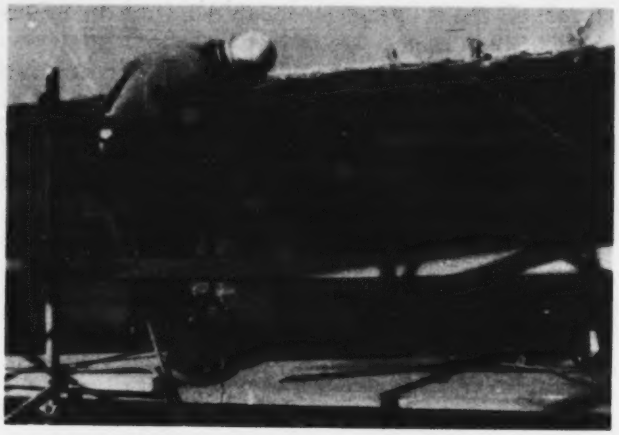
"Remove combustible materials around hot work, such as welding and cutting.

"Open flames, torches, and sparks from electrical equipment or grinding are well-known fire hazards. The presence of combustible materials magnifies the possibility of fires and explosion. So keep all chemicals, fuel, paints, and other petroleum-based products as far as possible from sources of heat or sparks.

"Keep scaffolds clear, especially when workers are below.

"If you are the fellow on the scaffold, the last thing you need is to trip over a hammer or a bucket of paint left on a scaffold plank. If you are the guy below the scaffold, you can certainly do without being struck by a falling hammer or splashed by an upset bucket of paint.

"Keep in mind that scaffold or deck clutter may hurt both you and your friends.



"Do not place heavy objects on hoses or cables.

"Shipbuilding and repair involves many lines, hoses, and cables for oxygen and fuel gas, electricity, and compressed air. You can rightly imagine that damage to the electrical cables could have serious consequences. Heavy objects can damage the cables and cause arcing, sparking, and even electrical shock.

"Keep stairs and walkways free of lines, hoses, and cables.

"You already know the reason for having clear passages during the normal course of a workshift: to prevent falls, of course. You probably know the other reason, too. It's to help you escape quickly in case of fire or other emergency."

The slide/cassette presentation consists of over 70 slides similar to these. The entire program, consisting of a loose-leaf tabbed binder containing the slides, the synchronized audio cassette, a script of the tape marked with slide cues, and the "Training Administration Manual," can be ordered for $110.00, plus $3.00 for postage and handling, from:

American Waterways Shipyard Conference
1600 Wilson Boulevard
Arlington, Virginia 22209
Tel.: (703) 841-9300

‡

Data Sought on Electricity-related Accidents

The Electronic and Electrical Equipment Section of the National Safety Council is currently undertaking a project to establish a data base on electricity-related industrial accidents. The data collected will be used 1) as a guide for developing training aids, 2) to evaluate present training materials, 3) to serve as a reference for Council representatives serving on various code panels and standards committees, and 4) to help member companies in their accident prevention efforts. All reports will be kept confidential and anonymous. Only the collective data of all reports will be used. The Council asks your cooperation in using the form below to report electricity-related accidents on the job that resulted in personal injury.

Instructions: This form is to be used to report data on industrial accidents where contact with live electrical conductors caused injury or was the underlying cause of an accident. Electric shock that initiated a chain of events which led to injury should be included. If more than one employee sustains injury from a particular accident, please complete a separate form for each employee.

Data on Injured Employee

1. Age __________
2. Sex __________
3. Occupation ___________________
4. Trained in _______________yes
   handling electricity _____ no
5. Date of injury ______________
6. Time of Day _________________
7. Time worked on day
   of injury _______________hrs.
8. Length of experience in
   handling electricity ____yrs.

Data on Injury:

1. Injury resulted from
   ____Direct contact
   ____No direct contact
2. Severity:
   ____First Aid
   ____Medical treatment
   ____Days restricted activity
   ____Lost work days
   ____Permanent disability
   ____Fatality.
3. Describe injury & part of body involved.
   ____
   ____
   ____

Description of Incident

____

____

____

Equipment Involved

1. Building Electrical Service Equipment
   _______Service Enclosure
   _______Panel boards, Switchboards
   _______Transformer, Rectifiers, Capacitors, etc.
   _______Fixed Wiring
   _______Other (Specify) _____________
   ____
2. Permanently Wired Devices
   _______Lighting
   _______Equipment
   _______Other (Specify) _____________
   ____
3. Stationary Plug-In Devices
   _______Lighting
   _______Equipment
   _______Other (Specify) _____________
   ____
4. Portable Electric Devices
   _______Tool
   _______Cord
   _______Test Equipment
   _______Portable Power Source
   _______Lighting
   _______Outlet Box
   _______Appliance
   _______Other (Specify) _______________
5. Temporary Wiring
   _______Lights
   _______Receptacles
   _______Other (Specify) _______________
6. Electrical Equipment
   _______Test Equipment
   _______Control Equipment
   _______Radio Frequency
   _______Other (Specify) _______________

Wiring Components Involved

_______ Receptacle
_______ Plug
_______ Connector
_______ Lamp holder
_______ Fuses
_______ Circuit breaker
_______ Switch
_______ Other (Specify) _______________
____

Power Source Involved

_______ Less than 50 volts
_______ Nominal 120 volts
_______ Nominal 240 volts
_______ Max of 480 volts
_______ Max of 1 kv.
_______ Max of 16 kv.
_______ Other (Specify) _______________

_______ d.c.
_______ single phase a.c.
_______ 3 phase a.c.

Contributing Circumstances

_______ Failure to follow instructions and/or safety rules.
_______ Deliberately working "hot."
_______ Unknowingly working "hot."
_______ Crowded workspace or difficult access.
_______ More than one power source.
_______ Inadequate "lock-out" - power on.
_______ Defect in tools or instruments used.
_______ Improper or degraded termination.
_______ Insufficient or degraded insulation.
_______ Overloaded circuit.
_______ Ground fault, lack of or poor equipment ground.
_______ Phase-to-phase short circuit.
_______ Fault or short circuit caused by foreign object.
_______ Misapplication of components or wiring.
_______ Improper wire size.
_______ Lack of personal protective equipment.
_______ Lack of protective tools.
_______ Drill-in or dig-in to live conductor.
_______ Other (Specify) _________________________________

Corrective Measures Taken/Remedial Action

____
____
____
____

Additional Comments

____
____
____
____

Send Completed Forms To:

Joseph H. VanSickle
Section Administrator
National Safety Council
444 N. Michigan Avenue
Chicago, Illinois 60611

To the Rescue:

Six Agencies Join Forces to Respond to Emergencies

by LCDR Richard W. Harbert
Chief, Port Safety Branch
Seventh Coast Guard District

It's Saturday, June 27, 1981--another warm, tropical day in San Juan, Puerto Rico. The British passenger vessel CUNARD COUNTESS sits gleaming in the sunshine alongside its berth in Old San Juan. Tourists and sightseers stroll along the pier, some stopping to admire the beautiful, large white vessel.

The peaceful scene described above is suddenly shattered at 10:45, when a phone call is received at a local police station reporting a bomb aboard the CUNARD COUNTESS. Emergency procedures are immediately set in motion, but the bomb explodes at 11:20, before the ship can be evacuated. Smoke begins to pour out of the vessel. Victims can be seen lying in the after section of the ship and struggling in the water alongside the vessel. As the crowd begins to swell, fire trucks roll in, and firemen begin spraying water into the ship.

These events and more did take place in San Juan this past summer. Happily, though, the victims were volunteers and the smoke resulted from a smoke bomb. The fire trucks, too, were simply part of a large-scale disaster preparedness exercise conducted to test the Puerto Rican Maritime Emergency Response Plan. This plan was developed by the U.S. Coast Guard, State Civil Defense, and several local agencies.

The staged event was somewhat reminiscent of an actual fire which occurred on the Italian

"Victim" on board CUNARD COUNTESS awaits help from rescuers.

passenger vessel ANGELINA LAURO on March 30, 1979, in Charlotte Amalie Harbor in St. Thomas, U.S. Virgin Islands. That fire, which destroyed the ship, produced a great deal of confusion among the many response organizations involved in the firefighting effort. A report by the National Transportation Safety Board called for improved planning for such incidents, better coordination among agencies, and the drawing up of interagency contingency plans. The ANGELINA LAURO fire accelerated efforts by the Coast Guard's Marine Safety Office in San Juan, Puerto Rico, to complete pre-planning with the governments of both Puerto Rico and the Virgin Islands. The resulting Puerto Rican Maritime Emergency Response Plan sets forth what response actions are to be taken by five commonwealth agencies and the Coast Guard and seeks to coordinate the actions of the six groups. The plan also provides for semiannual emergency response exercises designed to: 1) train Emergency Response Team personnel in the use of the Response Plan, agency contingency plans, and emergency response equipment, 2) identify improvements for the contingency plans, and 3) provide a means for updating the information on which the contingency plans are based.

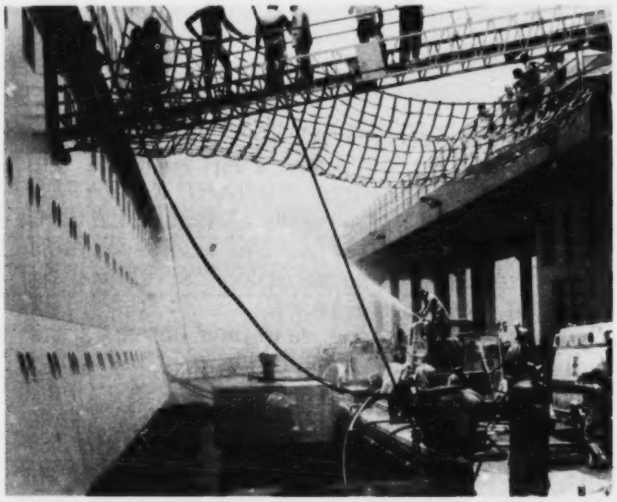
The simulated explosion and fire aboard the CUNARD COUNTESS set the stage for the first such exercise. It was announced to the participating agencies and aimed to test both the plan itself and the agencies' ability to respond.

Cunard Cruise Lines graciously volunteered the use of its 950-berth vessel, which arrived early on the morning of the drill. Since the CUNARD COUNTESS' cruises begin and end in San Juan, the drill could be conducted between voyages.

The drill, which took three hours to complete, ultimately involved nearly 1,500 people. Response activities included the following:

- the firefighting efforts of firemen from three fire trucks which parked along the pier apron and three aboard a barge which was brought alongside the CUNARD COUNTESS,
- firefighting assistance from the Coast Guard Cutter POINT WARDE and a port authority vessel,
- recovery of the "victims" from the water by Coast Guard vessels,

Captain of the Port San Juan (CDR James Parent) weighs concerns prior to making decision.



Dockside firefighters join the effort to put out flames on the CUNARD COUNTESS.

Above, emergency medical aid is provided for "victim" aboard CUNARD COUNTESS. Right, medical personnel provide emergency medical aid to "victims" brought to dock. Below, "victims" await transport to area hospitals.

- triage (screening for priority treatment) and medical emergency evacuation by Civil Defense of 100 "victims" with extremely realistic moulage (molded) wounds,
- emergency medical treatment by Health Department volunteers following evacuation of "victims" across the gangway,
- transport of the "victims" in numerous ambulances to 22 area hospitals where emergency room treatment was administered,
- crowd and traffic control by the police,
- establishment of a safety zone around the vessel and pollution control by the Coast Guard's Marine Safety Office, and
- overall coordination and provision of a mobile command post by Civil Defense.

Following the exercise, the performance of the responding agencies was extensively critiqued. Each of the agencies was able to assess both its own capabilities and those of the other agencies. Problems that remained to be resolved also came to light. One of the many positive results of the exercise was the good working relationship demonstrated by the Coast Guard, the marine industry, and the local/commonwealth government. The exercise in Puerto Rico, and others like it, should significantly improve response to maritime emergencies, if and when they occur. ‡

1982 International Ice Patrol Service

In February or March 1982, depending on iceberg conditions, the International Ice Patrol will commence its annual service of guarding the southeastern, southern, and southwestern limits of the regions of icebergs in the vicinity of the Grand Banks of Newfoundland. Reports of ice in this area will originate from passing ships and from flights by Ice Patrol aircraft. Twice each day, the Ice Patrol will broadcast a bulletin and a daily radiofacsimile chart containing ice information to inform ships of the extent of this dangerous region. Broadcasts of the Ice Patrol Bulletin will be made as indicated below:

BROADCAST STATION	TIME OF BROADCASTS (GMT)	FREQUENCIES (kHz)
SITOR ICE BROADCAST Coast Guard Communication Station Boston/NIK	0018 1218	5320, 8502 8502, 12750
CW BROADCASTS Coast Guard Communication Station Boston/NIK (Best to follow SITOR bcst)	0030 (APPROX) 1230 (APPROX)	5320, 8502 8502, 12750
Canadian Forces Station Mill Cove/CFH	0130, 1330	438 (Off-air 1200-1600 second Thurs each month) 4255 (2200-1000) 6430 Continuous 8697 Continuous 12726 (1000-2200) 16926.5 On request 22397.5 On request
LCMP Broadcast Norfolk, VA (Coast Guard Communication Station Portsmouth/NMN)	0030-0115 0630-0715 1000-1100 1230-1300 1900-1945 2300-2359	8090 Continuous 12135 Continuous 16180 Continuous 20225 (1200-2359)

BROADCAST STATION	TIME OF BROADCASTS (GMT)	FREQUENCIES (kHz)
Thurso, Scotland	same times	7504.5 Continuous 12691 (0800-1900) 3724 (1900-0800)
Keflavik, Iceland	same times	5167 (1900-0800)
RADIOFACSIMILE BROADCASTS		
Coast Guard Communication Station Boston/NIK	1600	8502, 12750 (+400 Hz)
Canadian Forces Station Mill Cove/CFH (Primarily sea ice in Gulf of St. Lawrence and North. Limits of icebergs sometimes given)	0000, 1300, 2200	133.15 Continuous (Off air 1200-1600 second Thursday each month) 4271 (2200-1000) 6330 Continuous 9890 Continuous 13510 (1000-2200)
Radio Station Bracknell, United Kingdom/GFE (Eastern North Atlantic Sea Ice Observations)	1413	2618.5 (1800-0600 Oct 1-Mar 31 1900-0500 Apr 1-Sep 30) 4782 Continuous 9203 Continuous 14436 Continuous 18261 (0600-1800 Oct 1-Mar 31; 0500-1900 Apr 1-Sep 30)
SPECIAL BROADCASTS Canadian CG Radio Station St. John's/VON	As required when icebergs are sighted outside the limits of ice between regularly scheduled broadcasts and as necessary prior to the commencement and after the close of the official Ice Patrol season	478 Preceded by International Safety Signal (TTT) on 500 kHz
USCG vessel when on International Ice Patrol duty	When in the vicinity of ice in periods of darkness or fog	2670 Preceded by International Safety Signal (SECURITE) on 2182 kHz

REPORTS OF ICE, SEA SURFACE TEMPERATURES, AND WEATHER

All ships may assist in the operation of the International Ice Patrol by reporting all sightings of ice (instructions below). When reporting ice, please include the following information:

POSITION
SIZE AND SHAPE OF ICEBERG
CONCENTRATION OF ICE (FOR SEA ICE, IN TENTHS)
THICKNESS OF ICE (FOR SEA ICE, SPECIFY IN FEET OR METERS)

When reporting icebergs to the Ice Patrol, please use the following categories:

DESCRIPTIVE NAME	HEIGHT (feet)	(meters)	LENGTH (feet)	(meters)
Growler	(G) less than 4	less than 1	less than 20	less than 6
Small Iceberg	(S) 4 - 50	1 - 15	20 - 200	6 - 60
Medium Iceberg	(M) 51 - 150	16 - 45	201 - 400	61 - 122
Large Iceberg	(L) more than 150	more than 45	more than 400	more than 122

TYPE

SHAPE	DESCRIPTION
Blocky	(B) Steep sides with flat top. Very solid. Length-height ratio less than 5:1.
Tilted Blocky	(V) Blocky iceberg which has tilted to present a triangular shape from the side.
Drydock	(K) Eroded such that a large U-shaped slot is formed with twin columns. Slot extends into or near waterline.
Pinnacled	(P) Large central spire or pyramid.
Dome	(D) Large, round, smooth top. Solid-type iceberg.
Tabular	(T) Flat-topped iceberg with length-height ratio greater than 5:1.

In addition to ice reports, the Ice Patrol needs sea surface temperature and weather reports to predict the drift and deterioration of ice and plan aerial patrols. Please make these reports to the Ice Patrol every 6 hours when within latitudes 40 N to 50 N and longitudes 42 W to 60 W. Ships with one radio operator may prepare the reports every 6 hours and hold them for transmission when the radio operator is on watch. When reporting, please include the following:

SHIP POSITION, COURSE, SPEED, VISIBILITY, AIR AND SEA SURFACE TEMPERATURE, WIND DIRECTION, AND SPEED.

It is not necessary to make the above weather report if the ship is making routine weather reports to METEO WASHINGTON.

HOW TO REPORT CONDITIONS

Report ice sightings, weather, and sea surface temperature to Commander, International Ice Patrol—COMINTICEPAT NEW YORK NY—through U.S. Coast Guard Communication Stations or, if unable to work these stations, Canadian Coast Guard Radio Station St. John's/VON. Make these reports in accordance with the following chart. Note that direct printing radio teletype (SITOR) is available through USCG Communication Stations Boston (NMF/NIK) and Portsmouth (NMM).

		BANDS GUARDED		
CALL	LOCATION	DAY	NIGHT	FREQUENCY
NMF NIK	USCG Communication Station, Boston, MA	500 kHz	500 kHz	427/472 kHz
		CALLING FREQUENCIES (Channel 4-5-6)		
		8 MHz	8 MHz	8459.0 kHz
		12 MHz	12 MHz	12783.0 kHz
		DIRECT PRINTING RADIO-TELETYPE SELCALL 1.01095 (Assigned frequency shown)		
		*4176.0 kHz	*4176.0 kHz	4355.5 kHz
		*6292.0 kHz	*6292.0 kHz	6500.0 kHz
		8349.5 kHz	8349.5 kHz	8710.5 kHz
		*12497.0 kHz	12497.0 kHz	13077.0 kHz
		16666.0 kHz	*16666.0 kHz	17203.0 kHz
		*22198.0 kHz	*22198.0 kHz	22567.0 kHz
		SSB VOICE FREQUENCIES (Carrier frequency shown)		
		6200.0 kHz	6200.0 kHz	6506.4 kHz
NMN	USCG Communication Station, Portsmouth, VA	500 kHz	500 kHz	466 kHz
		CALLING FREQUENCIES (Channel 4-5-6)		
		8 MHz	8 MHz	8465.0 kHz
		12 MHz	12 MHz	12718.0 kHz
		16 MHz		16976.0 kHz
		DIRECT PRINTING RADIO-TELETYPE SELCALL 1.01097 (Assigned frequency shown)		
		*4172.0 kHz	*4172.0 kHz	4351.5 kHz
		*6258.0 kHz	*6258.0 kHz	6496.0 kHz
			8357.0 kHz	8718.0 kHz
		2504.5 kHz	12504.5 kHz	13084.5 kHz
		16673.5 kHz		17210.5 kHz
		*22205.5 kHz	*22205.5 kHz	22574.5 kHz
		SSB VOICE FREQUENCIES (Carrier frequency shown)		
		1200-0200 GMT	0200-1200 GMT	
			4143. 3 kHz	4428.7 kHz
		6200.0 kHz	6200.0 kHz	6506.4 kHz
		8241.5 kHz	8241.5 kHz	8765.4 kHz
		12342.4 kHz		13113.2 kHz
VON	Canadian Coast Guard Radio Station, St. John's, NFLD	500 kHz	500 kHz	478 kHz

*Available upon request

Vessels equipped with MARISAT may send messages at their own expense to COAST GUARD NYK (TELEX NO. 126831).

The Ice Patrol Office in New York can be reached by telephone throughout the season. The numbers are:

(212) 668-7882 (Ice Patrol Duty Officer) or
(212) 668-7055 (Coast Guard Operations Center).

GULF OF ST. LAWRENCE INFORMATION

From (approximately) December to late June, the Canadian Ministry of Transport provides sea ice information services for the Gulf of St. Lawrence as well as the area of the Strait of Belle Isle from longitude 58-00 W to 66-30 W. Ships may obtain ice information by contacting Ice Operations Officer, Dartmouth, Nova Scotia, via any east coast Canadian Coast Guard radio station. Details of the services are available from the Ice Operations Office, Marine Services Information Center, Ministry of Transport, P.O. Box 1013, Dartmouth, Nova Scotia. Telephone: (902) 426-5664 or 5665. TELEX: 019-22625.

SUPPLEMENTARY ICE INFORMATION

Supplementary information on ice conditions and navigational warnings for the Strait of Belle Isle, the coast of Newfoundland, and the Grand Banks can be obtained by contacting the Canadian Coast Guard radio stations St. Anthony/VCM, Comfort Cove/VOO, St. Lawrence/VCP, or St. John's/VON.

WARNINGS

1. In spite of the best efforts of the Ice Patrol, icebergs have drifted and may drift unnoticed into the usual shipping routes in the area of the Grand Banks. The positions of icebergs in the Ice Bulletin are computed at 12-hour intervals. However, after about 5 days without an iceberg's having been resighted, the positions estimated by driftings are unreliable. The Ice Bulletin indicates the dates of iceberg sightings.

2. In general, icebergs approaching and to the south of latitude 48 N appear in the Ice Bulletin. In the event there are large numbers of icebergs south of 48 N, the Ice Bulletin will carry the positions of only those icebergs near the limits of ice and isolated icebergs.

3. Careful tests by the Ice Patrol have proved that radar cannot provide positive assurance of iceberg detection. Since sea water is a better reflector of radar signals than ice, an iceberg or growler inside the area of sea return on the radar scope may not be detected. The average range of radar detection of a dangerous growler or very small iceberg, if such bergs can be detected by radar at all, is only 4 miles. While radar remains a valuable aid for ice detection, its use cannot replace the traditional caution exercised by mariners in the vicinity of the Grand Banks while transiting south of the estimated limits of all known ice.

COMMENTS

The Ice Patrol earnestly solicits comments, particularly concerning the effectiveness of the times and frequencies of radio transmissions. Please mail facsimile charts received at sea to Commander, International Ice Patrol, Governors Island, New York, NY 10004. Please indicate the frequency used and position of the ship when it received the broadcast. ⟂

A Review of Fishing Vessel Safety--Past and Present

by Richard C. Hiscock

As the world's population and hence the need for protein increases, so will the effort to harvest food from the sea. There is every indication that the U.S. fishing fleet is growing steadily and will continue to grow as new demands and new markets are developed.

Unfortunately, there will also be, if current trends continue, an increasing number of deaths resulting from fishing vessel casualties. If this trend is to be reversed, some very positive steps must be taken to improve vessel design and construction, manning, and requirements for firefighting and lifesaving equipment. Whether these steps will be taken by government in conjunction with industry or by industry alone remains the subject of debate.

It is the opinion of this author that little significant improvement in fishing vessel safety will be seen until the Coast Guard is given broad authorization by Congress to regulate safety requirements for all commercial fishing vessels.

What follows is a brief review of marine safety approaches, legislative efforts, existing fishing vessel regulations, and recent fishing vessel casualty statistics.

Three distinct approaches can be taken to improve marine safety:

- Designing and building safer vessels
- Training and licensing operators—making them responsible for safer operation
- Requiring modern firefighting and lifesaving equipment to improve the chances of survival and rescue in the event the men or vessels fail.

All three of these approaches have been taken over the years to improve safety aboard U.S. cargo and passenger vessels: vessels are designed and built to standards and inspected regularly, operators and crews are licensed, and firefighting and lifesaving equipment is prescribed and inspected. These efforts have resulted in an excellent safety record for these vessels.

Recreational boat safety received a boost when Congress passed the Federal Boat Safety Act of 1971. This law granted the Coast Guard authority to develop regulations for construction as well as lifesaving and related equipment. Under this law, manufacturers are required to comply with construction standards. Operators are required to supply and maintain approved lifesaving and firefighting equipment. The Act also authorized funding to states for boating safety programs.

There have been several legislative attempts to improve safety on fishing vessels, but none has been successful.

In 1935-36 (during the post-MORRO CASTLE reorganization of marine inspection laws) various proposals were made to regulate motor vessels (15 gross tons or over) in the same manner as steam vessels. Steam vessels—including steam-propelled fishing vessels [which are no longer being built]—were already subject to inspection and manning requirements. Despite the eloquent testimony of some that the lives of fishermen working on motor vessels were just as important as those working on steam vessels—method of propulsion should not determine safety requirements—fishing vessel and towboat interests were successful in defeating these proposals. Thus Congress sanctioned the dubious concept of "uninspected commercial vessel."

In 1938 an attempt was made to remedy this situation. Several bills were introduced to correct the generally recognized deficiencies of the Motorboat Act of 1910. The original proposal by the Bureau of Marine Inspection and Navigation included provision for the certification of operators and the inspection of vessels 15 gross tons or over. Again, fishing and towboat interests exerted considerable pressure, and the Bureau was forced to recommend that the inspection and certification provisions be withdrawn. No motorboat bill was enacted that year.

Two years later the much less comprehensive Motorboat Act of 1940 (MBA-40) was passed, repealing the Motorboat Act of 1910. This legislation was originally adopted to address recreational motorboat safety only. The MBA-40 differs from most acts in that it limits regulatory authority to those few items specifically set forth in the Act. In other words, no regulations can be promulgated requiring commercial uninspected vessels to have any of the new safety features resulting from the technological developments of the last 40+ years unless the MBA-40 is amended. Although the legislation was directed at recreational motorboats, it governs commercial uninspected vessels as well. Since no regulatory program dealing specifically with fishing vessel safety has ever been developed, this means that the only safety regulations which apply to fishing vessels are those found in the MBA-40.

Since the MBA-40 was never intended to address commercial vessel safety, it does not adequately address any of the three approaches to marine safety outlined at the beginning of this article. There are no construction standards for fishing vessels. Operators need not be licensed unless the vessel is carrying passengers. Finally, firefighting and lifesaving equipment requirements are woefully insufficient, particularly given recent developments in rescue and survival technology. The regulations applied to commercial fishing vessels are thus inadequate, out-of-date, and restricted by the language of the law.

In 1941 a bill was introduced by Representative Thomas A. Flaherty of Massachusetts specifically addressing fishing vessel safety. It proposed "to place fishing boats [15 gross tons or over, fishing outside Inland Waters] under the supervision of the Bureau of Marine Inspection and Navigation." It outlined specific requirements for watertight bulkheads, bilge pumps, ring buoys, life preservers, lifeboats, radio telephone, first-aid kits, line-throwing guns, annual inspection, and the licensing of operators. A great deal of research in support of the bill was presented by the Atlantic Fishermen's Union of Boston, representing Northeast fishermen. However, most other fishing industry representatives opposed the bill, particularly the provisions for watertight bulkheads and the licensing of operators. Owing largely to the events of December 7th (1941), the bill was never enacted. No fishing vessel safety bill has been considered since, yet fishing vessel casualties are, among commercial vessels, the leading cause of death.

Many commercial fishing vessels fail to meet even the minimum requirements found in MBA-40. Enforcement is hampered by the stipulation that a vessel must be underway to be cited for a violation. Also contributing to this state of affairs is the lack of a uniform national educational program for fishing vessel safety, which might improve the situation.

Casualty data for commercial fishing vessels are at best incomplete. The Coast Guard's enforcement power in regard to casualty reporting is limited, as is its manpower. Many accidents involving uninspected commercial vessels thus go unreported or are not investigated, particularly those involving state-numbered commercial vessels.

If progress is to be made in the area of fishing vessel safety, a first step will be to gather more complete data.

However, a review of the available data—the latest available statistics, for Fiscal Year 1979 (FY-79), can be found in the December 1980 issue of the Proceedings of the Marine Safety Council—reveals significant information concerning fishing vessel safety.

During FY-79 there were 4,665 casualties reported involving 8,159 commercial vessels. Seventy percent (5,695) of the vessels involved were uninspected. About twenty percent (1,272) of those were fishing vessels.

But fishing vessel casualties resulted in almost 50 percent (92) of the 190 deaths reported on uninspected vessels. Eighty-four percent (77) of these deaths were a result of flooding, foundering, or capsizing. Overall, casualties involving uninspected vessels accounted for about 90 percent (172) of all deaths reported.

"Drowning" is the reported cause of death in 77 percent of all deaths reported. The role of hypothermia in these deaths is not revealed in the data.

In his examination of fishing vessel data for 1978 and 1979 (see the August 1981 issue of the Proceedings), John Crawford of the Coast Guard's Marine Safety Evaluation Branch makes the distressing observation that, despite advances in the technology of both ship design and lifesaving equipment, "the absolute number of deaths and the number of deaths adjusted to the number of fishing vessels appear to be holding steady or even rising slightly. Worse yet, the number of deaths relative to the number of vessels lost seems to be rising."

If there is to be a significant saving of life, property, insurance premiums, and search-and-rescue effort, there must be a national fishing vessel safety program that addresses all three approaches to marine safety outlined at the beginning of this article.

Design and construction standards should be established for various classes of vessels, types of fisheries, and regions. Vessels should be inspected regularly to ensure that maintenance of hull, machinery, and lifesaving/firefighting equipment is carried out.

Operators should be educated and licensed for the various vessel classes, fisheries, and regions to ensure knowledge of the navigation rules and seamanship appropriate for their particular vessel, fishery, and region.

The positive results of such long-term programs would take several years to be realized. There is, therefore, an immediate and urgent need to upgrade lifesaving and firefighting equipment requirements, taking advantage of modern technology to increase the chances of survival and rescue in the event that vessels and men are overwhelmed by the sea.

The author of the preceding article is a consultant on fishing vessel safety and emergency rescue-survival equipment and the author of Safety Notes for Fishermen, a monthly newsletter for commercial fishermen. He prepared the article in connection with his work as a member of the Water Safety Committee of the National Safety Council. As stated, the views expressed are his and do not necessarily reflect the official position of the Coast Guard. The policies he describes are just three approaches to increasing safety on fishing vessels. Other approaches (lawsuits, high insurance premiums for vessels with poor safety records, etc.) certainly exist. Articles or letters from other readers expressing support for their ideas are always welcome.—Ed. ⍏

Lessons from Casualties

STABILITY AND FISHING VESSELS

Certain types of fishing vessels have very serious stability problems, and it appears that many fishermen are not aware of the danger. Two classes of vessels stand out:

- the East Coast clam and scallop vessels and
- the Alaska crabbing vessels.

East Coast clam fishermen may have gotten the word about stability a few years ago, when several vessels were lost. The need for a better understanding was certainly there, and as new people come into this industry there may still be a danger. The problem is clearly indicated by the statement made by one fisherman after his vessel sank: he couldn't understand why the vessel sank—it was an easy-riding, comfortable vessel, and it had been in worse weather. What he did not realize was that the cause of the comfortable ride was also the cause of the lack of stability. The vessel rolled gently because it did not have enough stability to roll with more snap. The fact that a vessel has withstood worse weather is not proof of seaworthiness. This vessel actually sank in what appeared to be acceptable weather, except that it was taking the seas on a stern quarter, which causes rolling. And roll is just what the vessel did—completely over.

Considering the weight of a loaded clam cage, about 6000 pounds, it is not hard to see why stability is a serious matter with these vessels. It is particularly problematic for the clammers with stern rigs: they lift the loaded cages high above the deck, and the steel tube frame of the lifting rig is massive and tall. One of the vessels that sank was raised and examined by a naval architect before being put back into service. Significant modifications had to be made in order for it to be safe. Tanks had to be taken out of service, bulwarks had to be modified, and a large quantity of fixed ballast had to be placed in the bilges. It is unclear how many other fishing vessels in use might be just as dangerous.

In the clam and scallop fishery, there is one phenomenon that is important to remember. When a load is suspended from a boom or crane line, the point of action of the weight is at the end of the boom, regardless of the height of the load. This means that a heavy cage of clams on deck has the effect of being lifted to the end of the boom even if it is lifted only one inch. This can have a very significant effect on stability.

The Alaska crab vessels have similar problems. They operate in some very stormy waters and have to be prepared for the worst. Generally, they are well built and maintained because the results of a mishap in those waters are very serious. Unfortunately, common sense all too often takes a back seat to the impulsive decision: "Hell, I can carry a few more traps." Which of the basic human failings is it—greed, stupidity, ignorance? For greed and stupidity, there is very little that an article like this can do. If ignorance is the problem, well that's another story. Gather 'round and listen—then tell your friends.

It makes a lot of difference how many crab traps are stacked on deck. Securing them tightly to the deck is not enough to make them safe. If they are too heavy and too high they will roll the vessel over—believe it, because it has happened too many times. The first time was once too often. One case comes to mind that shows how far some people will go. The boat was so overloaded that it did not make it past the breakwater—the first wave capsized it.

One of the most recent cases involved a vessel that was examined by a naval architect. It was determined to conform to the stability criteria recommended by the Inter-Governmental Maritime Consultative Organization (IMCO) for fishing vessels, provided the vessel was loaded in accordance with its crab pot loading table. The loading table allowed a maximum of 77 650-pound crab pots to be arranged in two tiers. When the vessel capsized, it was carrying 90 crab pots arranged in three tiers. The extra 8450 pounds stacked in a third layer were too much for the 107-foot vessel of 199 gross tons. Three of the five crewmembers died.

Another recent case involved a 46-foot vessel of 30 gross tons. Fortunately, this accident occurred in June, and two of the four crewmembers managed to survive, even though they had to spend the night on top of the overturned hull. The boat was loaded with 120 dungeness crab pots weighing about 125 pounds each, and 95 of these were stowed on deck. The Coast Guard report on this casualty indicates that the 12,000 pounds on deck (some of the pots were stacked five high) was probably the cause of instability that allowed the boat to be overwhelmed by a large wave.

There are no regulations or laws requiring stability standards for U.S. fishing boats. It is the boat owner's responsibility to make sure that the vessel is constructed properly for its intended use, and it is the boat operator's responsibility to use the boat correctly and pay proper attention to the forces of nature. Unfortunately, it appears that many owners depend on "seaman's eye" or some kind of a guess to determine the safe load-carrying capacity of a vessel, and operators also do this. Operators sometimes fail to heed available forecasts and allow themselves to get into weather that should be avoided. This lack of prudence is taking a toll in lives and vessels. Every owner should have his vessel(s) examined by a naval architect to see that construction and equipment are correct for the intended use and to calculate safe operational limits after performing a static inclining test. THEN OWNERS AND OPERATORS SHOULD USE THE INFORMATION—A LOT DEPENDS ON IT.

The IMCO recommendations for stability criteria are very interesting and offer several approaches to the problem of stability. The two relevant IMCO documents, "Recommendation on Intact Stability of Fishing Vessels" and "Recommendation for an Interim Simplified Stability Criterion for Decked Fishing Vessels Under 30 Meters in Length" have been reprinted by the Coast Guard and are available as Navigation and Vessel Inspection Circular No. 3-76. Requests should be directed to U.S. Coast Guard Headquarters, G-MP-4/14, Washington, DC 20593. ⟂

Chemical of the Month

Phosphoric acid: H_3PO_4

synonyms: orthophosphoric acid

Physical Properties	75%*	80%*	85%*
boiling point:	132°C (270°F)	142°C (288°F)	155°C (311°F)
freezing point:	-18°C (0.5°F)	5°C (41°F)	21°C (70°F)
vapor pressure (in mmHg)			
at 20°C (68°F):	5.65	none found	2.16
at 110°C (230°F):	340	none found	160

Density	75% and 80%		85%
liquid (water = 1.0):	1.6		1.7

Threshold Limit Values (TLV)

time weighted average (TWA): $1\ mg/m^3$
short term exposure limit (STEL): $3\ mg/m^3$

Identifiers

U.N. Number 1805
CHRIS Code PAC

*Commonly shipped concentrations

Did you know that when you were drinking a soft drink you were drinking phosphoric acid? Phosphoric acid is an ingredient in many carbonated beverages. As a matter of fact, the "phosphate" drink popular in years gone by was based on phosphoric acid.

The fact that phosphoric acid is also used for such purposes as making plastics fire-retardant is an indication of this chemical's extreme versatility. In 1980 only eight other chemicals were produced in larger quantities than phosphoric acid. The major portion went into the making of fertilizers. Other industrial uses include treating metal surfaces, bonding high-alumina refractory products, manufacturing chemicals, catalyzing chemical reactions, flameproofing cellulose fabrics, and making nylon, ethyl alcohol, and detergents. Phosphoric acid is also used to refine sugar and is an ingredient in jams, jellies, salad dressing, yeast and vegetable oils, in addition to the soft drinks mentioned above. Phosphoric acid is an essential nutritional product. The U.S. Recommended Daily Allowance, the level which will provide a margin of nutritional safety, has been set at 0.1 gram.

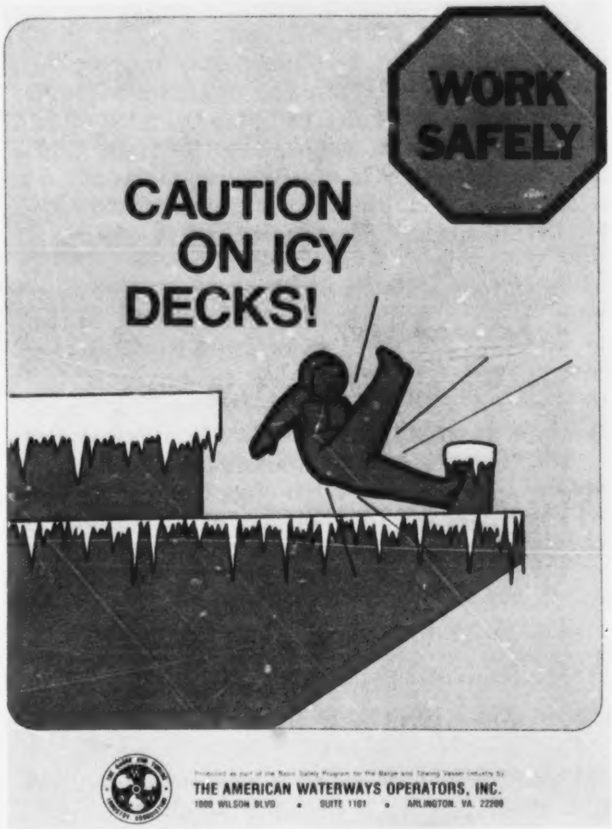
A three-step process is often used to produce phosphoric acid: phosphorous is burned to produce an oxide, the oxide reacts with water to form an acid mist, and the acid mist is collected. An older and cheaper method involving a reaction between phosphate rock and sulfuric acid produces crude phosphoric acid. With either method, the acid must be purified to remove such contaminants as fluorine, calcium, iron, aluminum, sulfate, and even arsenic. Many phosphorous-containing rocks also have small amounts of by-product uranium, which can be recovered.

The phosphoric acid used in foods is a very pure "food grade" and is extremely dilute and thus harmless. Concentrated phosphoric acid, however, like other acids, can be quite harmful. The chemical is shipped at concentrations ranging from 35% to 85%, although the most common concentrations are 75%, 80%, and 85%. A 75% solution can cause skin burns. Since the vapor pressure of phosphoric acid is so low, phosphoric acid vapor presents no appreciable hazard, except possibly in enclosed, unventilated spaces. The Threshold Limit Values (recommended maximum levels for short- and long-term exposure) shown above are for the acid mist (tiny liquid droplets). This mist, which can be generated during handling of the chemical, is an irritant to the eyes, upper respiratory tract, and skin. As is the case with other strong acids, persons handling phosphoric acid should wear goggles, face shields, and respirators; coverings for the head, skin, feet, and hands may also be required. If any acid is spilled on the skin or in the eyes, the affected area should be flushed with large quantities of water; if the acid is swallowed, large quantities of water should be drunk and vomiting induced. In either case, medical attention should be sought immediately.

Fortunately, phosphoric acid does not burn. Concentrated phosphoric acid is highly corrosive, however, and, as such, can react with various metals, generating hydrogen, a highly flammable gas. The tanks in which phosphoric acid is shipped are normally constructed of either rubber-lined steel or a stainless steel that resists corrosion by phosphoric acid; a third possibility is lining the tanks with a material approved for phosphoric acid.

The U.S. Coast Guard regulates phosphoric acid in Parts 151 and 153 of Title 46 of the Code of Federal Regulations, and the Materials Transportation Bureau regulates it as a corrosive material. Both the Inter-Governmental Maritime Consultative Organization (IMCO) and the Environmental Protection Agency classify it as a Category D Pollutant.

Hazard Evaluation Branch
Cargo and Hazardous Materials Division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Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. When a vessel is towing another vessel, the towing line should be

A. as long as possible.
B. of such a length that one vessel will be on a crest while the other is in a trough.
C. of such a length that the vessels will be "in step."
D. as short as possible under the circumstances; not over two wave lengths.

REFERENCE: Knights

2. Which is true concerning the speed of fronts?

A. Cold fronts move faster

than warm fronts.

B. Cold fronts move more slowly than warm fronts.
C. Cold fronts and warm fronts move with equal speed.
D. Cold fronts move more slowly at the northern end, thus allowing the warm front to overtake the northern section.

REFERENCE: Meteorology--Donn

3. Magnetism is strongest in soft iron when

A. the long axis of the iron is perpendicular to the lines of force.
B. the long axis of the iron is parallel to the lines of force.
C. the iron is at a 45° angle to the lines of force.
D. none of the above, since the magnetic strength will not vary.

REFERENCE: Bowditch

4. A vessel floating at its light draft displaces 7,400 tons. The center of gravity at this draft is 21.5 feet above the keel. The following weights are loaded on the vessel:

WEIGHT	VCG
450 tons	17.4 feet
220 tons	11.6 feet
65 tons	7.0 feet

The distance above the keel of the new center of gravity is

A. 20.9 feet.
B. 18.7 feet.
C. 17.8 feet.
D. 14.7 feet.

REFERENCE: Stability and Trim—La Dage

5. When lifeboat winches with grooved drums are fitted on a vessel, the lead sheaves to the drums shall be located to provide fleet angles of not more than

A. 4°.
B. 8°.
C. 12°.
D. 16°.

REFERENCE: 46 CFR 33.10, 46 CFR 94.33-10

ENGINEER

1. Feedwater supplied to a flash-type distilling plant will flash to vapor in the first stage because the flash chamber

A. pressure is lower than the saturation pressure corresponding to the feedwater temperature.
B. temperature is higher than the evaporation temperature of the supplied feedwater.
C. heat exchange surfaces are directly in the path of the entering feedwater.
D. orifices finely atomize the heated feedwater entering the flash chamber.

REFERENCE: Harrington

2. At sea level, how many BTUs must be added to one pound of water at 32°F to raise the temperature to 212°F?

A. 16 BTUs
B. 144 BTUs
C. 180 BTUs
D. 970 BTUs

REFERENCE: Principles of Naval Engineering

3. Erosive tube failure in a heat exchanger could be the result of

A. high temperature.
B. waterside fouling.
C. excessive cooling water velocity.
D. poor heat transfer.

REFERENCE: Osbourne

4. Excessive wear on the shaft sleeve running through the stuffing box of a centrifugal pump will

A. cause new packing to be torn and scored.
B. cause severe pump vibration at operating speed.
C. damage the packing gland stuffing box.
D. damage the pump casing interstage seals.

REFERENCE: Centrifugal Pumps

5. The total static head of a system against which a centrifugal pump must operate is the difference in elevation between the

A. discharge liquid level and the suction liquid level.
B. discharge liquid level and the pump centerline.
C. suction liquid level and the pump centerline.
D. suction submergence level and the pump discharge.

REFERENCE: Centrifugal Pumps

ANSWERS

DECK
1.C;2.A;3.B;4.A;5.B
ENGINEER
1.A;2.C;3.C;4.A;5.B

INDEX TO COAST GUARD REGULATIONS

Many of the publications previously included in this list (under the title "MERCHANT MARINE SAFETY PUBLICATIONS") were unavailable because they were being revised or reprinted. These publications were reprints of selected subchapters of the Code of Federal Regulations (CFR). The Superintendent of Documents publishes the CFR in yearly updated form, and the CFRs are thus the best source for those needing up-to-date information on Coast Guard regulations. Information on the price and availability of any desired volume can be obtained by calling (202) 783-3238 or writing: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Safety-related publications not falling into the CFR-reprint category will henceforth be published periodically in a separate list.

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard shipping regulations (Title 46, Chapter I of the CFR). Chapter I comprises nine volumes. A desired volume should be ordered by referring to the parts it contains; for example, if marine engineering regulations (Subchapter F) are needed, 46 CFR Parts 41 to 69 (the third volume) should be ordered. The numbers shown in the "Coast Guard Equivalent" column refer to previous reprints of selected subchapters. See the chart below.

Volume	Coast Guard Equivalent	Contents
1. 46 CFR Parts 1 to 29	None	Subchapter A—Procedures Applicable to the Public. Parts 1 to 9.
	CG-191	Subchapter B—Merchant Marine Officers and Seamen. Parts 10 to 16.
	CG-258	Subchapter C—Uninspected Vessels. Parts 24 to 29.
2. 46 CFR Parts 30 to 40	CG-123	Subchapter D—Tank Vessels. Parts 30 to 40.
3. 46 CFR Parts 41 to 69	CG-176	Subchapter E—Load Lines. Parts 42 to 46.
	CG-115	Subchapter F—Marine Engineering. Parts 50 to 64.
	None	Subchapter G—Documentation and Measurement of Vessels. Parts 66 to 69.
4. 46 CFR Parts 70 to 89	None	Subchapter H—Passenger Vessels. Parts 70 to 89.
5. 46 CFR Parts 90 to 109	CG-257	Subchapter I—Cargo and Miscellaneous Vessels. Parts 90 to 106.
	None	Subchapter I-A—Mobile Offshore Drilling Units. Parts 107 to 109.
6. 46 CFR Parts 110 to 139	CG-259	Subchapter J—Electrical Engineering. Parts 110 to 139.
7. 46 CFR Parts 140 to 155	None	Subchapter N—Dangerous Cargoes. Parts 146 to 149.
	None	Subchapter O—Certain Bulk Dangerous Cargoes. Parts 150 to 154.
8. 46 CFR Parts 156 to 165	CG-268	Subchapter P—Manning of Vessels. Part 157
	None	Subchapter Q—Specifications. Parts 160 to 165.
9. 46 CFR Parts 166 to 199	None	Subchapter R—Nautical Schools. Parts 166 to 168.
	CG-323	Subchapter T—Small Passenger Vessels (Under 100 Gross Tons). Parts 175 to 187.
	None	Subchapter U—Oceanographic Vessels. Parts 188 to 196.
	None	Subchapter V—Marine Occupational Safety and Health Standards. Part 197.

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard regulations on navigation and navigable waters (Title 33, Chapter I of the CFR). Chapter I consists of a single volume containing 19 subchapters. Subchapters and/or parts of this chapter are not published individually; the entire volume must be ordered.

Volume	Coast Guard Equivalent	Contents
1. 33 CFR Parts 1 to 199	None	Subchapter A—General. Parts 1 to 26.
	None	Subchapter B—Military Personnel. Parts 45 to 53.
	None	Subchapter C—Aids to Navigation. Parts 60 to 76.
	None	Subchapter D—Navigation Requirements for Certain Inland Waters. Parts 80 to 86.
	None	Subchapter DD—Implementation and Interpretation of the 72 COLREGS. Parts 87 and 88.
	None	Subchapter E—Navigation Requirements for the Great Lakes and St. Marys River. Parts 90 to 92.
	None	Subchapter F—Navigation Requirements for Western Rivers. Parts 95 and 96.
	None	Subchapter G—Regattas and Marine Parades. Part 100.
	None	Subchapter H—Routes for Passenger Vessels. Part 105.
	None	Subchapter I—Anchorages. Parts 109 and 110.
	None	Subchapter J—Bridges. Parts 114 to 118.
	None	Subchapter K—Security of Vessels. Part 122.
	None	Subchapter L—Waterfront Facilities: Security Zones and Regulated Navigation Areas. Parts 125 to 128.
	None	Subchapter M—Marine Oil Pollution Liability and Compensation. Parts 135 and 136.
	None	Subchapter N—Artificial Islands and Fixed Structures on the Outer Continental Shelf. Parts 140 to 147.
	None	Subchapter NN—Deepwater Ports. Parts 148 to 150.
	None	Subchapter O—Pollution. Parts 151 to 159.
	None	Subchapter P—Ports and Waterways Safety. Parts 160 to 165.
	M16752.2	Subchapter S—Boating Safety. Parts 173 to 183.

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DEPOSITORY 376

"...Be it enacted that the provisions of an act to amend section forty-four hundred and eighty and forty-four hundred and eighty nine of the Revised Statutes of the United States approved March the second eighteen hundred and eighty nine, be and the same are hereby repealed insofar as they relate to the provisions of chapter one hundred and two, section sixty-five of the Act of February the twenty-eighth eighteen hundred and seventy-four..."

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Commandant

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cover

The quotation on the cover is typical of the antiquated language that appears throughout Title 46 of the U.S. Code. For an account of what the Coast Guard is doing to modernize this outdated body of law, see the article beginning on page 85.

Plastic Butane Bottle Hazard

A Navy ship operating in the Mediterranean reported the explosion of a plastic butane lighter refill bottle.

The bottle exploded when it fell from a desk top. These bottles were acquired in Naples, Italy, from both authorized vendors on board ship and from street merchants. The tapered bottom of the bottles, with four plastic dots for feet, makes them unstable when more than half full—also contributing to the hazard.

The red plastic insert tops stick in the open position after use, creating a fire hazard. It was also reported that when these bottles are thrown overboard, a similar explosion will occur on impact with the water.

Tentative Interim Amendment to NFPA 306 Issued

Recently, the Board of Directors of the National Fire Protection Association (NFPA) upheld the decision of the NFPA Standards Council to amend NFPA-306-80, Control of Gas Hazards on Vessels, relating to the duties of a Marine Chemist.

The change, in the form of a Tentative Interim Amendment (TIA), effective December 9, 1981, reads as follows:

> 2-1. The Marine Chemists Shall Personally Determine Conditions.
>
> A Marine Chemist may issue a certificate setting forth in writing that the prescribed work to a vessel can be undertaken with safety. The Marine Chemist shall physically inspect the conditions and carry out tests within each compartment or space ensuring compliance with the minimum applicable requirements to his satisfaction prior to issuing a Certificate providing for SAFE FOR WORKERS or SAFE FOR HOT WORK.

For further details contact Charles Keller, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269; (617) 328-9290.

INMARSAT Now Operational

On February 1, 1982, INMARSAT (the International Maritime Satellite Organization) began operation of its worldwide satellite communication system. INMARSAT has leased three satellites from MARISAT for operation in the Atlantic, Pacific, and Indian Ocean areas.

INMARSAT is expanding the satellite-based communication system currently operated by MARISAT, a group of U.S. common carriers. That system provides voice, telex, facsimile, and data communications to commercial mariners. INMARSAT is committed to maintaining the level of service while extending the service worldwide. INMARSAT will further expand service by leasing five additional satellites from the European Space Agency and the International Satellite Organization (INTELSAT) in 1982 - 1983.

INMARSAT is developing procedures to ensure the rapid and efficient handling of distress calls and the relaying of these calls to the appropriate rescue authorities. Specifications are also being developed for a satellite system for distributing navigational and meteorological data. Also on the agenda are plans to participate in the testing of satellite EPIRBs (Emergency Position Indicating Radio Beacons) to be conducted by six countries under an international coordinated trials program.

IMCO, the Inter-Governmental Maritime Consultative Organization, is developing requirements for a future distress system to be based on satellite communications and satellite distress alerting by an automatic float-free EPIRB. INMARSAT will provide the satellite communications for that system.

Lloyd's Publishes New Edition of Maritime Atlas

Lloyds of London Press Ltd. recently announced publication of the 13th edition of the Lloyd's Maritime Atlas. Some 10,000 ports and shipping centers are listed in the volume, which is divided into three sections. The first has 28 pages of worldwide maps; the second lists the ports in geographical order and shows latitude and longitude; and the third is an alphabetical index, suitably cross-referenced. Over 600 changes have been made since the last edition was published. The new edition also incorporates many new maps and shows the North Sea gas and oil fields.

Copies of the atlas can be ordered for $32.00 from Lloyd's of London Press Ltd., 205 E. 42nd Street, New York, NY 10017. ⚓

The following items of general interest were published between December 17, 1981, and January 21, 1982:

Final rules: CGD 81-061 Drawbridge Operation Regulations; Amite River, Louisiana, December 17, 1981. CGD 5-81-06R Anchorage Regulations; Norfolk, Virginia, December 17, 1981. CGD 81-055 Drawbridge Operation Regulations; Saint Joseph River, Michigan, December 17, 1981. CGD 2-81-01 Safety Zone: Uper Mississippi River, Mile 633.7 to 636.7, December 28, 1981 (removal). CGD 14-81-01 Drawbridge Operation Regulations; Honolulu Harbor, Hawaii, January 11, 1982. CGD 8-81-01 Safety Zones: Vicinity of Old River Control Structure, Mississippi River, January 11, 1982.

Rule termination: CGD 77-233 Navigation Lights for Small Vessels, January 7, 1982.

Notices: CGD 81-102 New York Vessel Traffic Service, Advisory Committee Meeting, December 28, 1981. CGD 81-105 Qualification of Schlumberger as Citizen, January 7, 1982. CGD 81-106 Port Access Route Study, Notice of Study Results (the areas of Maine, Massachusetts, New Hampshire, and Rhode Island), January 7, 1982. CGD 81-062 Proposed Change to Operating Regulations for Multnomah County Drawbridge across the Willamette River at Portland, Oregon, Notice of Public Hearing, January 21, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Optional Method of Admeasurement Proposed for Vessels under 79 Feet

Tonnage, known as "admeasurement," is actually a reflection of the volume of a vessel rather than its weight or cargo capacity. Tonnage measurement is used to determine the applicability of domestic laws and regulations. It is also used as a basis for computing limits of liability, as well as tonnage duties, port and pilotage fees, and similar charges. Current law requires on-scene measurement of all spaces within a vessel. The intricate process involved (known as "formal admeasurement") must be carried out in accordance with complex statutory and regulatory requirements and calls for complicated measurements and calculations requiring a knowledge of integral calculus. Admeasurement is therefore a relatively expensive and time-consuming process.

The Tonnage Admeasurement Simplification Act (P.L. 96-594), signed into law on December 24, 1980, gave smaller vessels—vessels under 24 meters (79 feet)--the option of using a simplified method. On January 18, 1982, the Coast Guard published a notice of proposed rulemaking on the subject. The proposed regulations would specify what vessels would be covered by the simplified admeasurement system and set forth what dimensions would be measured and how calculations would be done. They would also provide for assignment of the same tonnages to vessels in the same class. For further information, contact James V. Higgins, U.S. Coast Guard (G-MMT-6), Washington, DC 20593.

Specifications for Pilot Hoists and Ladders Finalized
(CGD 74-140)

When a vessel is away from dock, pilots or other personnel are transferred aboard ship by means of a pilot hoist or ladder. In times of emergency, chain ladders can be used for boarding lifeboats and life rafts.

On December 28, 1981, the Coast Guard published a final rule containing new specifications for pilot hoists and revised specifications for pilot ladders and chain ladders. The new specifications remove many unnecessary detail requirements to allow for innovative design. Requirements for pilot ladders are based on Chapter V, Regulation 17 of the Safety of Life at Sea Convention (SOLAS) 1974. The pilot hoist specifications incorporate standards adopted by the Inter-Governmental Maritime Consultative Organization (IMCO) in 1973. The regulations govern the materials, construction, performance, and approval of the equipment and are aimed at ensuring greater safety for those using the equipment to board or leave a ship.

Anyone wishing to comment on these rules may do so by contacting the Marine Safety Council at the address given above before March 28, 1982.

Annexes to Inland Navigation Rules Published (CGD 81-008, 81-006, 81-009)

To coincide with the entry into force of the Inland Navigation Rules, the Coast Guard published Annexes I, II, and III to the Rules in December 1981. These annexes contain the technical information necessary for compliance with the new rules, along with additional signal requirements for fishing vessels.

Annex I concerns the positioning and technical details of lights and shapes. Included in the annex are information regarding horizontal and vertical positioning and spacing of lights, color and intensity specifications for lights, maneuvering lights requirements, and regulations regarding screens for lights and shapes.

Annex II deals with the additional signals for fishing vessels fishing in close proximity. It includes technical details, as well as requirements for trawlers and purse seiners.

Annex III provides technical details for sound signal devices. Included in these regulations are requirements for the frequency, range of audibility, and intensity of sound signals, plus directional and positioning characteristics. Also included in this annex are requirements for bells and gongs, as well as regulations for combined whistle systems and towing vessel whistle systems.

A public hearing was held on January 6, 1982, to discuss Annex IV of the Inland Navigation Rules, which deals with visual distress signals. This annex will be published as a final rule in the future.

For further information concerning these annexes, contact Chris Llana, U.S. Coast Guard (G-NSR-3), Washington, DC 20593; (202) 245-0108.

Regulations Regarding Barge Carriage of Certain Dangerous Bulk Cargoes Revised (CGD 80-001)

When a carrier proposes shipment of a chemical in bulk by water, the Coast Guard reviews the chemical and any hazards which may be associated with it. Should a certain cargo be considered dangerous, the Coast Guard regulates the material to ensure its safe carriage. These regulations are contained in Title 46, Part 151 of the Code of Federal Regulations. Since the original regulations were written, many new cargoes have been accepted for shipment and modifications and changes have been made to existing regulations. In a final rule published December 28, 1981, the Coast Guard incorporated all changes in an updated version of Part 151. The additions and deletions include:

1. Benzene-hydrocarbon mixtures having 10% benzene or more (addition)

2. Methyl-tertiary-butyl ether (deletion)

3. Benzene, toluene, xylene mixtures having 10% benzene or more (addition).

In addition to these and many other additions and deletions, errors which appeared in the previous Part 151 have been corrected.

For further information about this final rule, contact Joseph J. Jakabcin, U.S. Coast Guard (G-MHM-3), Washington, DC 20593; (202) 426-6260.

Puget Sound Navigation Rules Changed (CGD 81-087)

Up until December 24, 1981, vessels navigating from the high seas or Canadian waters into Western Washington passed from an area governed by the 72 COLREGS to one governed by the inland navigation rules. In order to make passage through this area safer and easier, regulations were changed so that the 72 COLREGS now apply in the Strait of Juan de Fuca, Haro Strait, and the Strait of Georgia and Puget Sound and all adjacent waters. This interim final rule, published December 17, 1981, went into effect on December 24, 1981, to coincide with the changeover of inland navigation rules that also took place that day.

Any comments concerning this interim final rule should be mailed to CDR Roger Pike, Chief, Port Safety Branch, Thirteenth Coast Guard District, 915 Second Ave., Seattle, Washington 98174.

An account of the actions taken by the Marine Safety Council at its January meeting was not ready at the time this issue went to press and will appear in the next issue instead. ⚓

The Open Conference: Grounds for Agreement

by CDR Roger Pike, USCGR
Chief, Port Safety Branch
Thirteenth Coast Guard District

The following success story, related to the Keynote on Puget Sound on the preceding page, reflects an important trend toward increasing consumer participation in rulemaking at an early stage, particularly when an agency has not yet decided on a specific regulatory solution to a problem. We thought it would be of interest to our readers, both those within the Coast Guard and the members of the public affected by Coast Guard regulations.

Public participation is a distinctive and important element in the U.S. system of developing government regulations. Input from the general public, and especially from public-interest and special-interest organizations, helps to ensure that regulations are meaningful, effective, and enforceable. No government agency could hope to have sufficient resident expertise to issue regulations without the benefit of such input.

The principal means of public participation in the rulemaking process have generally been submission of written comments and attendance at public hearings. Both approaches allow the private citizen or interest group to take a position—either pro or con—on the proposed regulations or provide alternative proposals. The general success of these means of gaining public input is evidenced by a national body of regulations which is widely accepted, fairly enforced, and generally effective.

There are situations, however, in which the traditional approaches to providing for public participation do not gain the hoped-for results. This is especially true when the subject matter is highly controversial or when the government agency does not have a draft regulation or position it is attempting to air but is merely seeking general input or proposals for a direction to pursue. In such cases, the result may be hardened or polarized positions or no clear consensus at all.

The Open Conference provides an alternative which is becoming increasingly popular. Because of the wide variety of forms the Open Conference can take, it can be tailored to meet the specific needs of the particular rulemaking effort. It can provide a forum in which people with widely differing interests and perhaps widely divergent positions are brought together to develop a consensus on the direction the sponsoring agency should take in the regulatory process. Such was the case at an Open Conference conducted by the Coast Guard in Seattle last October.

The subject was vessel traffic congestion and user conflicts on Puget Sound and adjacent waters. While Puget Sound clearly does not have the kind of major vessel congestion characteristic of the Houston Ship Channel or the restricted waters of many East Coast ports, it does experience many conflicts between mariners engaged in multiple and often conflicting uses of waterways. Typical of these conflicts are deep-draft vessels navigating in channels where large numbers of commercial fishermen have set their nets and tugs with barges attempting to find a safe course through heavy concentrations of sailboats. All users have an equal right to be on the water, and many do not fully appreciate the special problems posed by their activities for their fellow mariners.

In April 1981 the Coast Guard published a notice in the FEDERAL REGISTER indicating that it would conduct a public hearing in Seattle to solicit public comment concerning ways in which the potential for conflicts could be reduced. The advance notice of proposed rulemaking did not propose any specific regulatory approach, although it did briefly address a number of possible actions. It also indicated that if the results of the public hearing were not conclusive, an Open Conference might be held.

Although the public hearing which was held in June was well attended, the input the Coast Guard received did not point toward a suitable regulatory remedy to the problem. The comments reflected considerable polarization of opinion and tended to put the interests of one group over those of others. The speakers testifying at this hearing were asked whether they would be willing to participate in a subsequent Open Conference; most said they would.

The Open Conference, which was scheduled for October 13 and 14, was publicized through mailings to interested individuals, organizations, and firms and through extensive press coverage. A public conference center was selected as the meeting site, thus avoiding any "turf" problems. Finally, every effort was made to ensure that a wide variety of possible positions and viewpoints was represented so the conference would be truly representative of the many users of Puget Sound.

The turnout for the conference was gratifying. Among those attending were representatives of deep-draft vessel interests, towboat operators, pilots, commercial fishermen, recreational boaters, and representatives from several State and Federal agencies. From the opening session on, the point was made and emphasized that the purpose of the conference was not to "sell" a Coast Guard position but to solicit recommended courses of action which the conference as a whole could agree to. It was also emphasized that while new or revised regulations could be one possible approach, the conference should not overlook any non-regulatory solutions. For example, it might be possible to address most of the user conflicts through "industry agreements" or other means.

After a brief opening session at which the problems to be looked at were outlined and the conference agenda was discussed, the conference was divided into four working groups. Each working group was made up of members representing a variety of interests and was given one aspect of the user conflict problem to address. Although a senior Coast Guard officer was assigned to each group to serve as facilitator, each group selected its own leader, who moderated the group and later served as its spokesman.

At the end of the first day, a second plenary session was held at which each of the four working groups presented its recommendations to the full conference. Comments were taken from the floor to be used later by the working groups to further refine their recommendations.

On the second day, the working groups reconvened for an additional two hours to rework their recommendations. At the final plenary session, these revised recommendations were presented to the full conference for adoption. In addition, comments and "minority positions" were taken from the floor. Only this final plenary session was recorded verbatim, and this verbatim transcript became the official conference report.

One of the measures receiving the support of the plenary session was a recommendation to disestablish the COLREGS Line of Demarcation between international and inland waters in the Puget Sound area. This, it was hoped, would eliminate possible confusion arising from the use of two different sets of navigation rules. (See the Keynotes section for details on the Coast Guard's interim final rule on this subject).

By almost any measure, this day-and-a-half Open Conference was a success. It provided the Coast Guard with a number of excellent recommendations which had the support of a wide spectrum of the maritime community. Perhaps more important, it provided an opportunity for members of conflicting interest groups to sit down together and work on mutual problems. In fact, one of the recommendations to come out of the conference was frequent meetings of the associations and organizations with primary interest in the multiple uses of Puget Sound.

The Open Conference is a flexible tool which can be used to gather input for a variety of rulemaking efforts. Its format can be adapted to both the subject matter and the composition of the interested public. It provides broad opportunities for public participation, is truly democratic, and encourages agreements rather than polarization. Although the Open Conference described here is only one of many approaches which might be taken, it could certainly serve as a model for any agency considering use of this highly effective forum.

As the issues which must be addressed in the rulemaking process become more complex and as public interest increases in those regulations dealing with health and safety, the Open Conference may prove to be an idea whose time has come. ⚓

Seventh Annual
Marine Safety Poster Contest

1st Prize	GOLDEN SAFETY POSTER AWARD - to be presented at the 1982 National Safety Council Congress in Chicago, Illinois.
2nd Prize	SILVER SAFETY POSTER AWARD - to be awarded to employer's representative attending the above Congress for eventual presentation to the 2nd Prize winner.
Sponsor's Award	SPECIAL GOLDEN SAFETY AWARD - to employer of 1st Prize winner to; be awarded to corporate representative attending the above Congress as a thank you to the company for its cooperation and interest in furthering safety in the industry.

RULES

1. The contest is open to any and all employees in the maritime industry who like to draw. All posters must be on a Marine Safety subject. Any maritime operation or situation afloat or ashore may be used.
2. Drawing must be confined to 7½" x 10" on standard 8½" x 11" white paper and should be done in **black** or **red** ink only. Drawings should be designed for **vertical** display. Bold letters and strong art count as well as subject matter. Only one idea should be emphasized.
3. The work must be signed. Submission automatically gives copyrights to the Executive Committee of the Marine Section of the National Safety Council, and the entrant releases all rights thereto.
4. The employer's name and address, as well as the entrant's name, address, and position, must be PRINTED and submitted with each entry.
5. All entries must be postmarked by or before midnight, June 30, 1982. As many entries may be submitted as desired.
6. Winners will be notified via their employers as soon as possible after the closing date.
7. Entries should be mailed to:

Chairman, Audio/Visual Aids and Posters Committee
c/o Ships' Operational Safety, Inc.
284 Main Street
Port Washington Harbor, NY 11050

OFFICIAL JUDGES

Elizabeth V. Stephens, Chairman
Vice President
Ships' Operational Safety, Inc.

John Faulk, Vice Chairman
Safety Director
Strachan Shipping Co.

Captain Robert E. Hart
President
Marine Index Bureau, Inc.

C. Bradford Mitchell
Maritime Consultant

Fourth Annual Marine Safety Photography Contest

Golden Safety Photography Award will be awarded to the person who submits the winning 35mm color slide. The award will be presented at the 1982 National Safety Council Congress in Chicago, Illinois.

Sponsor's Golden Safety Award will be presented to the employer of the winner in the color category in appreciation for its cooperation and interest in furthering marine safety.

Silver Safety Photography Award will be awarded to the person who submits the winning black-and-white photograph. The award will be presented at the above Congress.

Sponsor's Silver Safety Award will be presented to a representative of the employer of the person submitting the winning black-and-white entry in appreciation for its cooperation and interest in furthering marine safety training.

RULES

1. The contest is open to any and all employees in the maritime industry who are photography buffs, either amateur or professional. All entries must be on a Marine Safety subject. Any maritime operation or situation afloat or ashore may be used. A safety topic should be depicted positively or negatively. The entrant should give his picture a safety title or slogan or briefly state the safety topic.

2. Color category: only 35mm slides will be acceptable. Entries will be judged for content, composition, originality, safety applicability, and pertinence.

3. Black-and-white category: glossy or matt prints 8" x 10" or larger will be acceptable. Entries will be judged for contrast, content, composition, originality, safety applicability, and pertinence.

4. Entries must be signed. Photographs and slides will not be returned. Submission automatically gives copyrights to the Executive Committee of the Marine Section of the National Safety Council, and the entrant and sponsor release all rights thereto.

5. The employer's name and address, as well as the entrant's name, address, and position, must be PRINTED and submitted with each entry.

6. All entries must by postmarked by or before midnight, June 30, 1982. As many entries in either the color or black-and-white category may be submitted as desired.

7. Winners will be notified via their employers as soon as possible after closing date. The winners' names and the names of their companies will be published in the NSC, Marine Section Newsletter.

8. Entries should be mailed to:

    Chairman, Audio/Visual Aids and Posters Committee
    c/o Ships' Operational Safety, Inc.
    284 Main Street
    Port Washington Harbor, NY 11050

OI[illegible]AL JUDGES

Elizabeth V. Stephens, Chairman
Vice President
Ships' Operational Safety, Inc.

John Faulk, Vice Chairman
Safety Director
Strachan Shipping Co.

Allan Litty
President
Flying Camera, Inc.

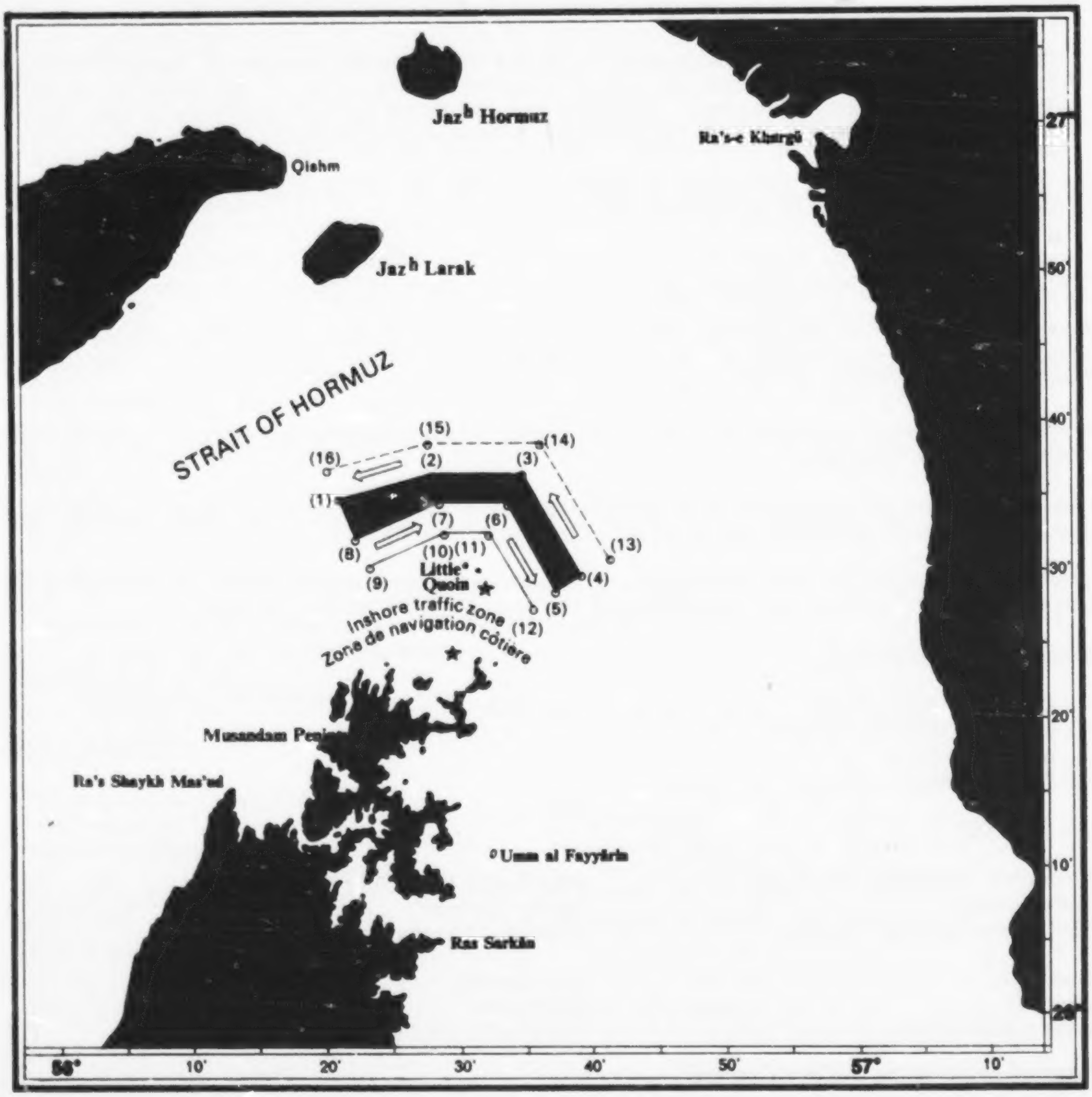
Bob Ahrens
President
Bob Ahrens Productions, Inc.

Non-compliance with Strait of Hormuz Traffic Separation Scheme Reported

The Coast Guard's Office of Merchant Marine Safety has received numerous reports of instances of non-compliance with the Strait of Hormuz Traffic Separation Scheme (TSS). Such non-compliance is in contravention to Rule 10 of the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS), which sets forth navigation requirements for vessels transiting traffic separation schemes. During investigations of these incidents the most often cited reason given for non-compliance with the Strait of Hormuz TSS has been an unawareness of its existence. Apparently, many vessels are transiting the area with outdated charts that do not depict the TSS.

Mariners are advised that charts are available which show the Strait of Hormuz TSS. One such chart is Defense Mapping Agency chart 62392 (4th edition, July 23, 1981). This chart is available from chart and nautical equipment suppliers throughout the United States and in many foreign countries. If this chart cannot be obtained from local sources, it may be ordered from the Defense Mapping Agency at the following address:

DMA Office of Distribution Services
Attn: DDCP
Washington, DC 20315


Jazh Hormuz
Qishm
Ra's-e Khargū
Jazh Larak
STRAIT OF HORMUZ
(15)
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Inshore traffic zone
Zone de navigation côtière
(12)
Musandam Penin
Ra's Shaykh Mas'ud
Umm al Fayyārīn
Ras Sarkān
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40'
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57°
10'
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50'
40'
30'
20'
10'
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The Fatigue Factor: the Insidious Enemy of the Mariner

by Captain Duke Diggs

My mate, Walt, arrived on the bridge of our tug just prior to midnight. As I began, somewhat groggily, to brief him on the weather, traffic, and our position, his eyes widened incredulously. "You'd better bring her left, Skipper," he said.

"Left," I thought. "Why, this whippersnapper has just stepped into the wheelhouse to assume the midnight to 0600 watch, and he is telling me what to do before he even relieves me at the helm!" Instinctively I glance at the compass and confirm our heading. 040°. Good.

But Walt, now yelling, shouts "Left, Duke, bring her left. You're heading straight for the bar!" Once more I start to defend myself, but the sincerity in Walt's voice suddenly sets off an alarm familiar to me as a result of my years of experience navigating coastal waters. I step back and relinquish the con to the younger man and watch as he hastily puts the MV SHARALIN's wheel hard left.

As our tug and the 300-foot-long oil barge we are pushing begin to respond to the helm and lazily start their swing to port, I finally see my error. I was actually on a heading of 140° instead of 040°! What happened? I've navigated St. Andrew Sound at night before. I know the course necessary to fetch the entrance buoy, even when its flash is obscured by the haze. I know about the "horseshoe" turn necessary to bring our tow safely around the eastern tip of the large sand bar which separates Jekyl and Cumberland Islands on Georgia's eastern coast. So how did it happen? How could I have made an error that put our tow in such jeopardy?

The incident above happened several years ago. But the questions it raised in my mind haunted me, and my subsequent search for their answers led me to the fascinating subject of fatigue. Because of a schedule change, I had neither slept nor eaten properly on the day prior to the near accident I've just described, and I was now determined to find out all I could about the effect of these physiological factors on the mariner.

Little Was Known

My inquiry revealed that at that time very little had been done in the marine industry in the way of research into the human factor of fatigue. I then turned to another industry in which I had experience, an industry which I consider to be the mariner's "next of kin": aviation. Navigation in the two fields is essentially the same, from the rudimentary compass to the highly sophisticated Loran C. And those using our nation's skyways must deal with the same elements--winds, weather, drift correction, and so on,—as those plying the waters off our coasts. The two fields have one other common meeting ground: command decisions.

The Captain has total authority—and total responsibility.

Initially, then, it was from the Federal Aviation Administration and aviation trade publications that I gathered my information. Later, however, I was able to obtain a report specifically addressing fatigue in the marine environment. "Watchkeeping and Safety," a very informative paper prepared by W. P. Colquhoun of the Medical Research Council Perceptive and Cognitive Performance Unit at the University of Sussex in Brighton, England, offered valuable data for my project.

I compiled the data available from many diverse sources, including areas not closely allied to the maritime industry but with common features. Manufacturing, for instance, has had experience with rotating shifts. This gave me the raw material that was later to provide meaningful insight into the effects of fatigue on the human body. I had already learned, in my own close call that June night aboard the SHARALIN so long ago, that these effects could be of great consequence. What I didn't know was that fatigue was also a factor—though unrecognized until very recently—in too many of the accident reports filed each year.

That "Tired" Feeling May Be More Than a Lack of Sleep

My studies indicated that adequate rest was essential for personnel standing watch aboard ship. Most medical authorities state that, although individuals vary in their personal sleep needs, the average need is eight hours and the sleep should be unbroken if at all possible. (More on sleep later.) As my investigation proceeded, I found that sleep was only one factor in the well-being of a mariner. I found that fatigue is often caused, or compounded, by medical factors.

Marine personnel who suffer from diabetes, hyper- or hypotension (high or low blood pressure), petit mal (a mild form of epilepsy), migraine headaches, asthma, or any of the many other common organic illnesses, are apt to be very much aware of their own limitations and prepared to cope with them.

This is not true, however, of the "healthy" mariner who is suffering from the equally common, but less well-known, hypoglycemia. Hypoglycemia is just one of a number of unconsciously self-induced maladies that can interfere with the mariner's level of alertness while he is on duty. These insidious conditions can cause almost any problem, from erroneous radar plotting to passing out cold at the helm.

What is hypoglycemia? Literally translated, it means "low blood sugar." But what exactly does this mean to you as a professional mariner?

Let me illustrate, with a hypothetical case, what can cause hypoglycemia in the typical mariner, how it relates to fatigue, and what effects it has on you. I will also discuss how you can prevent it from interfering with your work.

Let's take "Harry," for example. Harry's typical watch might begin something like this. He arises at 0700, showers, shaves, dresses, and heads for the galley. Harry never feels too much like eating a decent breakfast. He does need that coffee, though, and he is fond of Danish pastries. He has several cups of steaming coffee with a couple of teaspoons of sugar in each, and, as he chats with his shipmates, he has a large piece of pastry with icing and a sweet filling. Harry feels much better now, and he climbs the stairs and bounces into the bridge wheelhouse with vigor. He feels well and is ready to go on watch and assume responsibility for the ship from 0800 to 1200 hours.

But what is going on inside Harry's body? A lot. Harry's pancreas is now working overtime. All of that sugar he ingested this morning has suddenly been absorbed into his bloodstream, reached his brain, and sent a signal from his hypothalamus to his pancreas that he is now hyperglycemic (his blood sugar level is too high). "Please give me some insulin right away," says Harry's body. And old Harry's pancreas does just that. It begins to pour insulin into his system to compensate for the extremely high blood sugar level.

What happens? The insulin does its job, all right. If you think back to Harry's breakfast, however, you'll remember that it consisted of coffee and a Danish pastry. Harry's body lacks the proteins and fats needed to accompany the high carbohydrate intake if the sugar is to be uniformly absorbed into his bloodstream and his body is to get a steady supply of fuel. So, when his blood sugar level falls in reponse to the insulin, he may begin to feel a little "lightheaded." Depending on his general condition, our friend Harry, the mate who has the con and is responsible for the safe navigation of his ship, just might pass out cold!

While passing out is an extreme reaction, it can happen. At the very least, an individual working with the food base just described is not going to be as alert as he might be otherwise, with some ham and eggs or other protein in his

NTSB Deems Fatigue Contributing Factor in Tug/Barge Accident

While Captain Diggs was ultimately able to avoid an accident in the incident described at the beginning of his article, the crew of the tug CAROLYN was not so lucky. The CAROLYN and its tow, the barge WEEKS NO. 254, were proceeding north in the Atlantic Ocean on September 20, 1972, when, because of heavy weather, they headed south to seek refuge in the Chesapeake Bay. The weather continued to deteriorate. The Coast Guard Cutter MADRONA and a commercial tug, the WARRENGAS, stood by, ready to assist the tug and barge.

After the CAROLYN and its tow passed over the Chesapeake Bay Bridge and Tunnel (CBBT), the CAROLYN began to list excessively to port. In order to facilitate the transfer of fuel from the port to the starboard tanks, the crew headed the CAROLYN into the wind. During this maneuver, a portion of the towing hawser coiled on deck washed overboard from the tug and fouled first the port, then the starboard, propeller. The fouling of the propellers caused a total loss of propulsion. At 0140 on September 21, after the crew of the CAROLYN had been evacuated by the MADRONA and after the MADRONA had made several unsuccessful attempts to take the WEEKS No. 254 in tow, the tug and barge struck a trestle on the western side of the CBBT. After the initial impact, the tug and barge drifted south and struck the CBBT in various locations. The CAROLYN then passed under the bridge, and the towing hawser parted. The CAROLYN drifted south and grounded on Chesapeake Beach; the WEEKS No. 254, buffeted by heavy winds, remained on the west side of the CBBT and pounded the structure for several hours. This pounding extensively damaged bridge pilings, bridge spans, and a portion of the roadway. No deaths or injuries occurred.

The National Transportation Safety Board (NTSB) determined that the probable cause of the casualty was: 1) the failure of the master of the CAROLYN to inform the MADRONA or the WARRENGAS of the existence of a quick-release anchor on the barge and 2) the incorrect decision made by the commanding officer of the MADRONA not to take the CAROLYN in tow as a last resort. Contributing to the failure was the fatigued state of the master of the CAROLYN; contributing to the incorrect decision was a statement by the master of the CAROLYN to the commanding officer of the MADRONA that the tug was sinking.

The master of the CAROLYN was an experienced operator, but he obviously had not planned sufficiently for the contingencies that might occur along his route. While his decision to seek shelter from the high winds and rough seas was appropriate, for example, there were no charts of the Chesapeake Bay on board. Entry into the bay had to be made in the dark without the use of charts or the radar, which had failed. That stress, plus his lack of familiarity with the CAROLYN's limitations in heavy weather, resulted in his being unable to respond adequately to the changing situation. The effect of the stress was heightened by the fact that the master had had no rest since before 0600 on September 20. These conditions may have led the master to take certain actions not compatible with those which he might have reasonably been expected to take. The master's three major inappropriate actions were:

1. Not securing the hawser when he prepared for bad weather,
2. Incorrectly assessing the degree of hazard associated with the additional list caused by excessive fuel in the port tanks, and
3. Forgetting to deploy the barge anchor or to alert the Coast Guard of its existence.

While it is impossible to determine how great a role fatigue played in this casualty, it is easy to see that, in his position, the master needed to be in maximum control of his faculties.

The Marine Casualty Report on this accident, Report No. USCG/NTSB-MAR-74-2, is available to the public from the National Technical Information Service, Springfield, Virginia 22161.

stomach, for instance.

Eat Well, Sleep Well, Feel Well . . .

A good diet is therefore just as necessary as sufficient sleep if we are to avoid fatigue. Let me illustrate with an organ that is both familiar—and essential—to the deck officer: the eye. The human eye is one of the first organs to feel and show the effects of fatigue. Whether we are suffering from too little sleep or overly long hours—perhaps we have been asked to "double-through" on a couple of watches—, our eyes are one of the first organs to be affected. Our field of vision narrows, peripheral vision deteriorates, and we could, just could, miss a crucial blip on the radar or an important course change. An adequate blood sugar level is absolutely necessary if our eyes are to function properly. Add low blood sugar to a shortage of sleep, and we can see the potential for disaster.

Sleep

We mentioned earlier that medical authorities generally agree that rest periods should not be interrupted. This is due in part to the discovery that our sleep is divided into two very distinct phases. These consist of, namely, REM (which stands for rapid eye movement) and non-REM sleep. In the non-REM phase, the eyes, if the lids are lifted, are found to be rolled back in their sockets, and the body is almost completely relaxed. In the REM phase, if the lids are lifted, the eyes will be seen to be moving very rapidly. It is during the REM phase that dreams occur. Although the exact nature of sleep is not known, it is believed that sufficient amounts of both REM and non-REM sleep are necessary for the proper functioning of the body.

Here is the kicker. We also know that an individual alternates between REM and non-REM sleep phases. It is possible, with some types of shift work, to upset this pattern. Experiments have shown that waking a person and depriving him of one or the other sleep modes produces undesirable side effects, such as nervousness, irritability, and difficulty concentrating. If we are to have the vitality needed for the demanding jobs on today's ships, we must therefore plan our rest periods to provide for an adequate number of cycles through each sleep mode.

We have now seen that "fatigue" is a syndrome with a much broader base than a simple lack of sleep. The importance of unbroken sleep periods and a balanced diet is clear. There is another physiological factor that contributes to a mariner's state of alertness, however, a factor that goes virtually unrecognized by both company management and the individual mariner. I am talking about "circadian rhythm."

The Internal Clock

The succession of REM and non-REM sleep phases is not the only cycle that influences a mariner's well-being. The body's biological rhythm—its circadian rhythm—also has a profound effect on his performance.

As before, the aviation industry was the first to recognize and study circadian rhythm (the so-called jet-lag concept became popular in the press a few years ago). Briefly put, circadian rhythm is a term applied to the series of temperature changes the body undergoes in the course of a day. These changes are indicative of one's adaptation to a certain sleep-wake cycle. Some folks are "day people," doing their best work during the day and sleeping at night. Others may be "night people," i.e., individuals who through adaptation for one reason or another sleep well during the day and feel comfortable and alert working through the night hours.

Any interruption or change in the sleep-wake pattern of an individual scheduled to stand an essential watch will result in a compromise in the operational safety of his vessel. Approximately ten full days are required for the recovery of the mariner who has had his "internal clock" desynchronized. This desynchronization can be caused by either a rapid crossing of time zones or an abrupt change in the sleep-wake cycle of a particular mariner. Thus, it can readily be seen that the mariner who works the typical rapidly rotating shift (the "swing" shift) common for so many inland boatmen is never working at his peak efficiency. The importance of circadian rhythm should not be overlooked by either the prudent mariner or the management of any marine company, if for no other reason than that corporate profits are tied directly to the safety and efficiency of a company's ships and the personnel who man them.

A Challenge to the "Time-honored" Four-on, Eight-off and Six-and-Six Traditions

Since company profits are directly related to safety and efficiency, a change to a steady, fixed-watch system could mean money in the bank. Some of the benefits, for instance, that have accrued to companies experimenting with fixed watches include better employee morale and fewer accidents. Both of these benefits, in turn, translate into such indirect savings as lower insurance rates and less vessel downtime.

Studies made both ashore and aboard ship have repeatedly shown that optimum performance of personnel occurs during fixed eight-hour shifts. An example of this arrangement might be three successive shifts running from 0800 to 1600, 1600 to 2400, and 2400 to 0800. The most efficient system would allow an unbroken rest period of 16 hours for each sailor following each eight-hour watch.

Provision can then also be made for personnel who are by nature "night people" to allow them to volunteer for the night duty.

On vessels presently employing a three-watch system (four hours on, eight hours off), a change to three eight-hour shifts would not result in any additional personnel costs. However, many tugs and other vessels in the merchant marine fleet, such as fishing and charter vessels, follow a two-watch, six hours on, six hours off, schedule. For them, implementation of the improved fixed-shift system would mean either the addition of an extra crew or a change to two twelve-hour shifts. Twelve hours is a long trick, even when stood aboard vessels equipped with good automatic pilots and modern, automatic navigation equipment, and I do not advocate this solution. I have met crew members, however, who say that the better rest during the resulting continuous twelve-hour rest period compensates for the long watch. This is especially true at sea, when an AB is allowed to take the con and let the watch rest his eyes for a short time. Hot meals during this type of watch are a must.

Two six-hour rests, on the other hand, usually result in only four or so hours of actual sleep at a time. Naturally, eating, bathing, shaving, and an adequate "wind-down" period after coming off watch must be subtracted from a given rest period.

While the alternative to the long twelve-hour watch—namely, the addition of an extra crew—may seem, at first, blush, to be unpalatable because of the cost involved, individual companies might wish to investigate the savings to be achieved from some of the side benefits I have mentioned. The cost of an additional crew would seem small compared to the bad publicity and clean-up costs resulting from an oil spill following a fatigue-induced accident.

While no clear-cut solution presents itself for the disruption caused by time zone changes, mariners and management should be alerted to potential problems. Adequate diet and rest are particularly important if the watchstanders are to maintain their ability to concentrate.

Know Thyself . . .

Since individuals vary greatly in both their need for sleep and their dietary requirements, we cannot draw generalizations. It is important, therefore, that each mariner know his own particular needs. Tune in to your body. Learn your average sleep time when you are not working. Get free literature from your local health department on nutrition. Try to eat well-balanced meals. Don't do this just to keep from becoming a "Harry," either. Eat properly, and you will look better, feel better, and do a better and safer job for your company.

Adequate Rest and Diet are Important to All Concerned

In summary, adequate crew rest and a proper diet are paramount to marine safety. They are important to everyone, from the crew members who do not want to risk "life or limb," to the deck officer who wishes to remain accident-free to protect his reputation and license, to the marine superintendent of a towing concern who would like to improve his company's profits, to the Coast Guard, where safety is the name of the game.

About the Author

Captain Duke Diggs is a practicing consultant for the maritime and aviation industries. His area of specialization is management and safety, and he has done research on fatigue and biomedical factors in both government and the private sector. Captain Diggs has extensive experience in the marine field and in the past has served as a master, relief captain, docking pilot, and tug skipper, as well as operations manager of a marine towing company. He can be reached at P.O. Box 145, Surry, Virginia 23883; (804) 229-9259.

UNITED STATES GOVERNMENT
Memorandum

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

DATE: **4 January 1982**

SUBJECT: Article on the Coast Guard Strike Teams, request for

FROM: Daniel L. Dewell, Public Information Assistance Team, Pollution Response Branch

TO: Editor, Proceedings of the Marine Safety Council

1. I received your request for an article about the strike teams of the National Strike Force (NSF) some time ago. When you asked for the piece, you said you didn't want the usual rundown on the teams, but something that explained what the duty is like, who the people are, and how they operate. It's not a bad idea, but after a couple of shots at it, I realized that this project wasn't going to be easy. Even though I've worked with the teams on a lot of cases and exercises, there is more to their duty than that.

2. There are 85 or 90 Coast Guardsmen assigned to the NSF. I'll bet if you asked them all what duty is like on a strike team, you'd wind up with 85 or 90 different answers. To be sure, it is unusual duty. NSF members find themselves traveling more than most of us, and, because groundings, collisons, oil-well blowouts, and the like cause some of the spills they work on, they have lots of good sea stories to tell. But if you write an article about spectacular cases, that really isn't a balanced view of what the teams do. They have their share of boring jobs that would be hard enough to write about, let alone expect someone else to read!

3. It's pretty hard to pin down the essence of life on a strike team. I suppose if you had to compare the job to something that everyone could relate to, you could use a fire station. Yeah, that's not bad. They have their own equipment, trucks, trailers, pumps, skimmers, etc., all designed for pollution response. They are on standby 24 hours a day, every day, and all it takes to get them underway is a phone call. Of course, not just anyone can call them. It has to be a Federal On-Scene Coordinator, either from the Coast Guard or the Environmental Protection Agency. Just like a fire station, each team has its neighborhood as a primary response area (about a third of the country in the case of a strike team). Of course, members cross over lines whenever necessary to give each other a hand.

4. Another problem might be the "SWAT team" syndrome. Since the names "National Strike Force" and "strike teams" have a certain ring to them, people often expect the NSF to come swooping in, leaping out of planes with booms and skimmers held in their teeth, recon the area, and wipe out any pollution that dares to show itself. It doesn't work that way. Sure, they have training, good equipment, and a great deal of experience and are prepared to respond quickly, but there is a limit to what can be done in pollution response. They do put in their share of strenuous work, but what few people ever hear about are the innumerable hours spent monitoring a spiller's cleanup or the tedious documentation work that NSF members do. What sounds like glamorous, exciting work on the surface can, at times, be frustrating or routine and is often out in the middle of nowhere. The weather never seems to help, either. I've heard strike team members swear that spills never happen in nice weather—it is either blisteringly hot or freezing.

Enough said. Here is the article I came up with:

Shore Duty That Keeps You "Underway"

"On the road again,
Goin' places that I've never been,
Seein' things that I may never see again,
I can't wait to get on the road again . . ." *

A jukebox in a truck stop cafe alternates between country-western and rock-and-roll music. The location: the Wyandotte exit off Interstate 64 in southern Indiana. The time: 6:30 a.m. A group of Coast Guardsmen occupies two tables in one corner of the restaurant, and large breakfasts are the order of the day. The servicemen make up about two thirds of the cafe's clientele at this hour. They have stopped at the cafe on their way back to the site of a gasoline barge fire on the Ohio River near the tiny burg of Alton, Indiana, after a well-earned rest at a motel in Corydon. Hot showers, clean sheets . . .

The men just described are members of the Coast Guard's National Strike Force (NSF)—a force dedicated to responding to pollution cases on the nation's waterways. A chance to sit and enjoy a hearty breakfast was a luxury for them, since there was no way of knowing when the next opportunity for a hot meal would be.

While most people in the Coast Guard (and many outside the service) have an idea of what the strike teams are and what their mission is, many people have either no idea, or a misconception of, what duty with the teams is really like.

Members of the NSF are skilled in pollution removal and containment methods, salvage, and damage control. They also provide communications as well as other forms of equipment

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support, along with diving services for vessel inspections and other underwater activities required in pollution response.

Calling in the Strike Team

A look at the Gulf Strike Team's response to a case on the Ohio River, not far from Louisville, Kentucky, in early December 1981 will give a clearer picture of this somewhat unique group within the Coast Guard. Two tugs with barges in tow collided, and several barges carrying petroleum products were damaged and caught fire. A great number of state and local agencies responded to the fire along with local Coast Guard units and other vessels on the river.

Neither the Coast Guard in general nor the NSF takes the lead role in ship or barge firefighting. Because of its familiarity with vessel safety and its involvement in marine disasters (search and rescue, pollution response, etc.), however, the Coast Guard is often brought in on fires in support and coordinating roles. In this case, there was an actual release of oil into the water and the potential for another, major, release.

The Federal On-Scene Coordinator (OSC) for pollution response in the area, the Commanding Officer of the Coast Guard Marine Safety Office (MSO) in Louisville, decided that certain personnel and equipment of the NSF would be needed to assist in the case.

LCDR Jim Tanner, Commanding Officer of the Gulf Strike Team (GST), remembered the initial call from MSO Louisville. "The OSC wanted three things in particular. First, he wanted the command post," Tanner said, referring to a mobile-home-type vehicle outfitted with office work spaces and communications equipment. "Second, he wanted an ADAPTS," Tanner continued, using the acronym for the Air Deliverable Anti-Pollution Transfer System—a high-capacity pump for offloading fuel and liquid cargo from damaged vessels. "And third, he wanted a comms package," said Tanner, employing service lingo for "communications package"—several portable radios for use at the many monitor stations that would be established during the case.

The National Strike Force was formed in 1973 when the Coast Guard was given new responsibilities for environmental protection under the Federal Water Pollution Control Act. It consists of three strike teams:

The **Pacific Strike Team,** based in San Francisco,

The **Gulf Strike Team,** based in Bay St. Louis, Mississippi, and

The **Atlantic Strike Team,** based in Elizabeth City, North Carolina.

There is also a dive team, which is attached to the Atlantic Unit. Members of the dive team respond to calls throughout the nation.

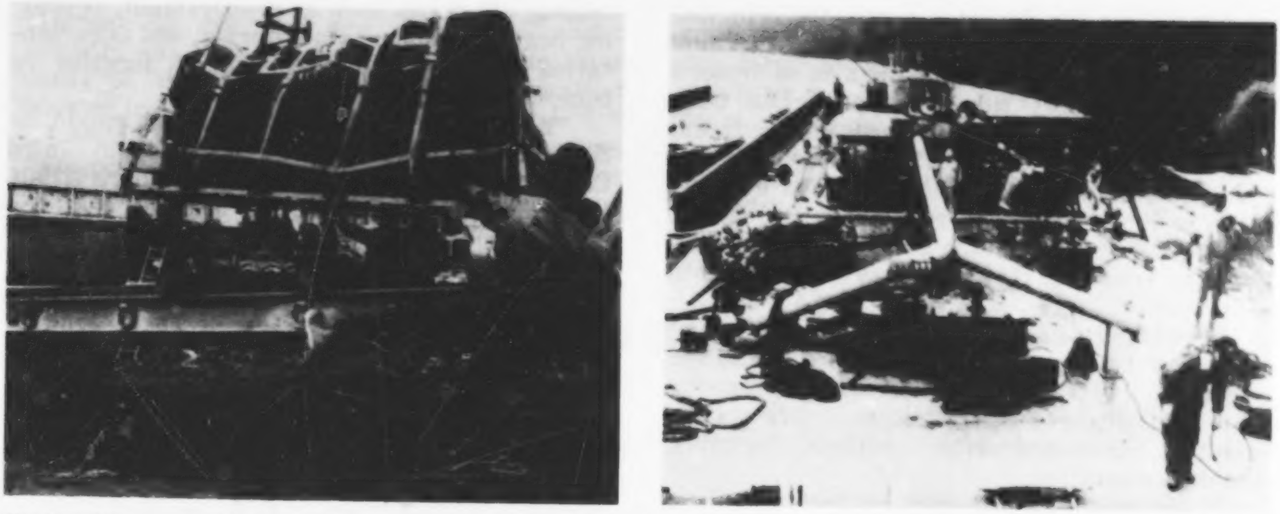
MOBILE
COMMAND POST
COAST GUARD

The mobile command post is shipped as a self-contained unit, complete with office work spaces and communications equipment.

Once the call came in, shortly after the collision occurred, members of the GST began putting together the proper equipment. This didn't take long, since the command post is a self-contained unit and all other pollution-reponse equipment maintained by the strike teams is pre-packed on pallets for quick loading onto trucks or cargo planes. In this case, a Coast Guard C-130 aircraft was available to fly the command post and several members of the team to an airfield near the scene. A GST tractor trailer was loaded with ADAPTS and other support equipment to be driven to the site on the fringes of Alton.

Setting Up

By the time the GST equipment arrived the following day, the fires on the tugboats and all but one of the barges had been extinguished. The command post arrived at the end of a dirt road beside the riverbank near a local picnic spot turned staging area. The GST members' initial duty was to get the command post set up



Strike team members (left) move an equipment pallet off of a tractor trailer and (right) get their equipment in place for the offloading of a barge.

and then join the OSC and his staff to assist in any way possible.

Logistics and communications are very important in any pollution response case. Yeoman First Class Russ Besancon, a GST member, noted how smoothly the establishment of the command post went. "It was great," he said. "The telephone man was practically waiting for the command post when it got there. Right after that, we had the power hooked up, and the command post was all set." In addition to arranging for utility services, Besancon and others on the strike teams often become involved in a kind of community-relations duty, especially when a case occurs near small, outlying towns. "Luckily, there was a little general store just up the road from the staging area. They had just about everything you could ask for up there. We did a lot of business there, buying things like gloves and supplies. They even opened up just for us a couple of times. Everyone in the town was really friendly and helpful." One local backhoe operator went so far as to turn down work with other customers to help out at the fire.

After the command post was set up and the tractor trailer arrived, the OSC and his staff met with firefighters and the vessel's owner to discuss plans for dealing with the potential pollution problem and the firefighting efforts. The barge owner was footing the bill for all firefighting activity, but the OSC and Coast Guard forces were on hand to coordinate pollution prevention and response and to provide logistics and communications support as needed.

The Strike Team Goes to Work

One of the barges that had been afire (the flames had now been extinguished) was damaged and still loaded with diesel fuel. It was decided that the fuel should be transferred to a safer vessel. The ADAPTS would be used to transfer the product.

LCDR Tanner recalled the operation. "It was a little harder than a normal pump job," Tanner said, comparing the task to other, "routine" transfer operations. "We wanted to keep the barge level so as not to spill cargo out or cause any strain on the vessel. The trouble was that we had to keep moving the pump from one tank to another to bring her up even--the regular lines and valves on the barge were damaged, so we couldn't just take suction on one tank and pump the cargo out through the barge's existing lines. My guys started that job Saturday afternoon and worked straight through into Sunday. They got 780,000 gallons off the damaged barge. That pump weighs several hundred pounds, and they kept having to move it back and forth. Those guys did one hell of a job," said Tanner, remembering just how difficult the circumstances were.

Southern Indiana has been known to be cold in early December, and this was no exception. Temperatures ranged from 5° above zero to just above freezing most of the time. When the temperature did rise above stinging cold, the relief from the cold was countered by the transformation of the frozen dirt road and the riverbank into muddy quagmires.

Once the team had completed the transfer of diesel from the damaged barge, the principal problem remaining was a burning gasoline barge. With a long slit down the side of tanks 4 and 5 of its port side, the barge had been pushed ashore about 200 yards downstream from the staging area. Thick orange flames rolled out of the side of the barge as a heavy black column of smoke rose from the scene. Many new arrivals on the scene said they had used the smoke to find their way to the remote site.

Because the barge owner accepted responsibility for firefighting, Coast Guard personnel were now involved in pollution response standby and firefighting support roles: fire-station monitors, communications stations, logistics, and documentation.

It took several attempts by both the local firefighters and later by commercial firefighters from Houston, Texas, to extinguish the blaze. Members of the strike team, like others at the site, found themselves going from one job to another as supplies, equipment, and personnel came and went from the scene.

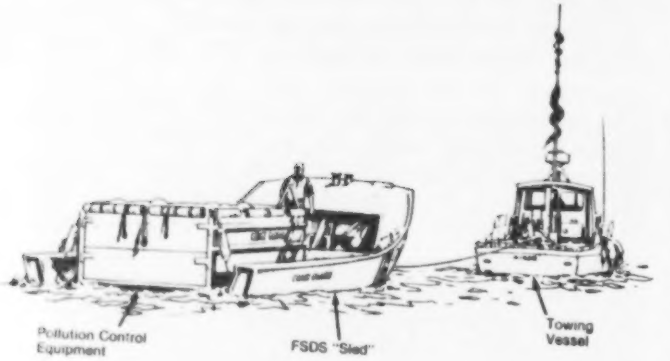
Masters of Many Trades

Strike team members handle transitions from one job to another smoothly. They are cross-trained in all jobs they may be called on to peform. It isn't unusual to see yeomen and boatswain's mates, officers, and enlisted men, trading off duties such as procurement, operating heavy equipment, monitoring, and documentation or simply lugging around supplies or equipment.

"You never really know what you might be doing next," said Damage Controlman Third Class Dennis Baxter, a GST member. Half sitting, half leaning across a formica desk top in the back of the command post, Baxter was taking advantage of a lull in the activity at the staging area. Having spent the morning hauling frozen fire hoses and barrels of foam concentrate to and from firefighting barges, Baxter appreciated the warmth of the command post. "One minute you'll be handling communications or keeping the logs, next thing you know you're off to set up some equipment or maybe making a run for parts."

The frustrating fire, cramped quarters, cold weather, and separation from home notwithstanding, GST members assigned to this case demonstrated an ability to maintain their sense of humor. A fireman opened the command post door, traces of the previous night's snow clinging to his mud-caked boots. He came in and started to pour a cup of coffee. "Well, when do you think this will all be over with?" he asked of anyone in the vehicle who cared to answer. Baxter, offering a humorous, seasonal response, sang out, "It's beginning to look a lot like Christmas . . ." A few of those on hand laughed; others seemed to be checking a mental

USCG Fast Surface Delivery System (FSDS)

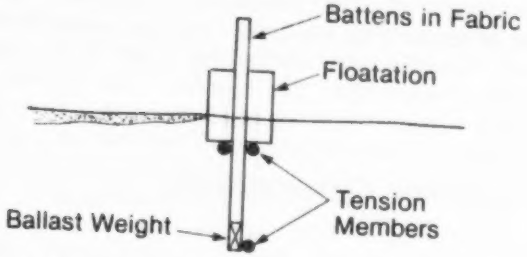


The **Fast Surface Delivery System** (FSDS), or"sled," was designed by the Coast Guard as a method of delivering pollution response equipment to a spill site. The sled is a shallow-draft, planing hull that must be towed by another vessel. The design of the sled gives smaller Coast Guard boats the capability of transporting heavy equipment that previously could be handled only by buoy tenders or other large ships. The stern section of the sled can be submerged to allow the loading and unloading of heavy cargo, such as the Coast Guard's open-water skimmer and skimming barrier. The FSDS sled is 45 feet long, has a 5-foot beam, and is capable of transporting 20,000 pounds of cargo.

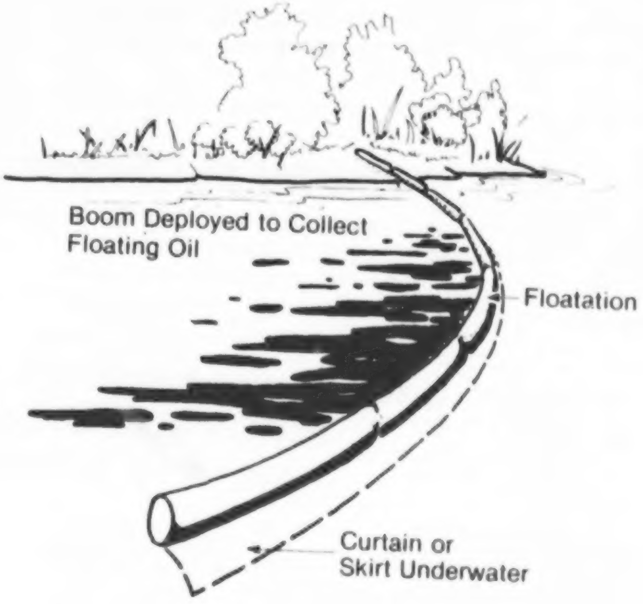
calendar to see just how close the holiday actually was. There wasn't much time to think about it, however, since news came in that another load of foam had arrived—almost.

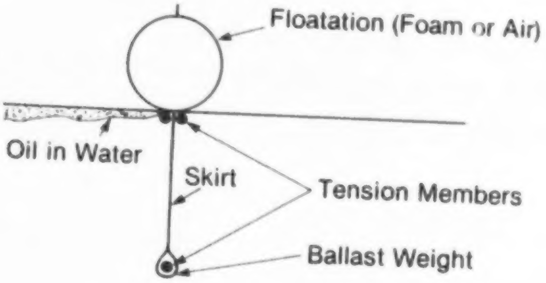
About one mile away, two tractor trailers were parked with 55-gallon drums and 5-gallon containers of foam. In between the trucks and the staging area was a small bridge, too small for the trucks to cross. Circling around to a route with a stronger bridge would have taken too long, so all available personnel and any small trucks on hand were sent to bring the foam across in small loads. The transfer of foam containers went quickly and smoothly as GST and local Coast Guardsmen formed "bucket brigade" lines to the long trailers, passing the containers and rolling the drums onto waiting trucks.

Boom Types



Fence Type - Centerline Floatation


Boom Deployed to Collect Floating Oil
Floatation
Curtain or Skirt Underwater



Flexible Curtain Type

Oil containment **boom** or barrier is one of the most common pieces of pollution control equipment. Boom comes in a wide variety of sizes designed for different weather and sea conditions. Lengths of boom are used like a floating fence to corral or deflect oil so that it can be removed from the water.

Different styles and sizes of boom are all designed around the same basic concept. An upper barrier keeps oil, floating on the surface of the water, from spreading. Naturally, there must be some type of floatation for the boom. On smaller types, floatation sometimes serves as the upper barrier portion of the boom. A skirt hanging below the floatation provides for added containment capabilities. This skirt must be constructed so that it is strong enough to hold back oil yet flexible enough to give with the motion of waves. Lastly, a ballast, usually made of lead and located at the bottom of the skirt, is included to keep the boom upright in the water and keep the skirt and upper barrier vertical.

Like all other equipment, boom has limitations as to what it can do. The primary problem in this type of operation is entrainment—oil being washed or pulled under the boom by the current. No matter how deep the skirt extends, water will flow underneath it, and currents over about one knot will cause entrainment. One way to combat this is to angle the boom and deflect oil rather than attempt to stop its movement. In some situations, the oil can be diverted to a collection point or an area with a slower current.

Paperwork

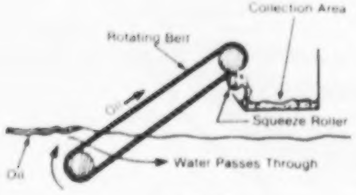
Like any other job, NSF duty involves paperwork. Keeping track of communications, logging all calls on the radio and phones, forwarding requests for equipment and information, and documenting the operation are all functions of the GST members assigned to the command post. These duties can be extremely important for case studies and legal proceedings that can arise after an incident is over.

The Final Stages

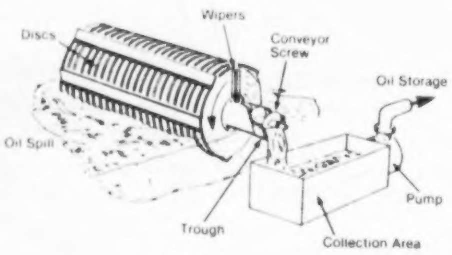
The barge fire was eventually put out. After several hours of checking and rechecking for any possible reflash, most of the firefighters were released from duty. The OSC informed LCDR Tanner that most of the GST personnel and equipment would soon be able to return to the base at Bay St. Louis, Mississippi, but a final decision would be made once the barge owner began successfully offloading the burned barge's gasoline into a sound vessel. GST members began strapping down the ADAPTS and other equipment for the trip back.

That evening, with the case all but over, "Miller Time" was declared by unanimous decision. Firemen, tugboat and barge crewmen, Coast Guardsmen, and others involved in the case found their way to the lounge at the motel where most of the response personnel had stayed when not on scene during the week-long case. Immediately occupying over half the available seats in the room, the diverse members of the crew began recounting the case

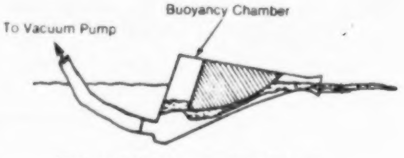
Principles of Common Skimmer Operation


Collection Area
Rotating Belt
Oil
Squeeze Roller
Water Passes Through
Oil

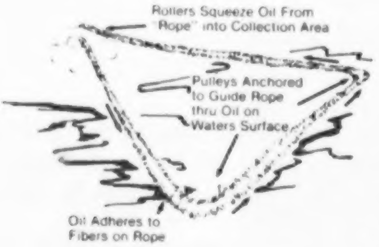
Porous Belt


Discs
Wipers
Conveyor Screw
Oil Storage
Oil Spill
Pump
Trough
Collection Area

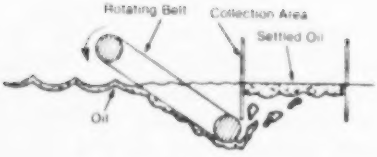
Disk Drum


To Vacuum Pump
Buoyancy Chamber

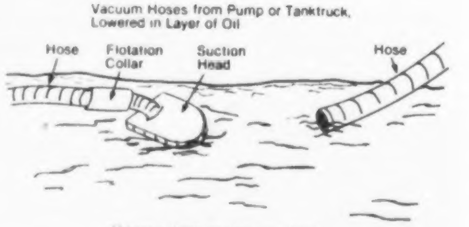
Mechanical Wier Combined with Vacuum


Rollers Squeeze Oil From "Rope" into Collection Area
Pulleys Anchored to Guide Rope thru Oil on Waters Surface
Oil Adheres to Fibers on Rope

Continuous Rotating Fiberous Rope


Rotating Belt
Collection Area
Settled Oil
Oil

Nonporous Belt


Vacuum Hoses from Pump or Tanktruck, Lowered in Layer of Oil
Hose
Flotation Collar
Suction Head
Hose

Vacuum Hose and Vacuum Hose with Floating Suction Head

There are many types and sizes of devices generally referred to as **skimmers,** which are used to pick up spilled oil and chemicals from the surface of water. They operate on various principles. Some skimmers employ a vacuum or suction, while others rely on physical contact or mechanical means for recovery of spilled products.

As is the case with most types of equipment, the effectiveness of skimming devices depends on many factors, including weather conditions, the type of product, and the location of the spill. Consequently, it is important to match the type of skimmer to the type of cleanup operation.

over cool drinks that somehow tasted better than usual. Finally, they had a chance to relax and swap a few sea stories.

But the job wasn't over yet, and the "celebration" didn't last long. Most of the response force members opted for a good night's sleep in preparation for wrapping things up.

The Wrap-up

The following morning the barge owner moored an empty barge alongside the burned one and rigged for offloading as Coast Guardsmen monitored the operation. By mid-morning, pumping had been started. By the end of the day, the OSC released the ADAPTS and most of the GST members. The command post and a few GST personnel would remain on scene until the offloading was complete and the barge stable.

LCDR Tanner told his men to meet for a planning session at the truck stop cafe on their way back to the motel. Everyone was tired, ready to go home. The case was just over a week old. With Russ Besancon taking notes, they worked out the details of getting everyone home. There was no cargo plane available, so the command post, when it was released, would have to be driven back.

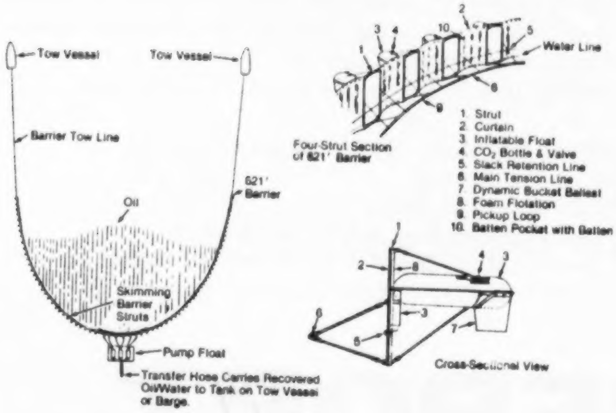
Call the airlines, check schedules, arrange for drivers for the truck and drivers for the command post, have the phone and power turned off . . .

Very early the next morning the GST tractor trailer set off on its way home while a group of GST members headed for the airport to fly home. The command post was released later that same day and started out on the 15-hour drive. The two vehicles and their drivers did encounter an ice storm on the trip back, but there were no accidents.

Back at the Base . . .

Upon return from the case in Alton it was time for reports to be written, travel vouchers filed, and "normal" operations resumed. Normal operations for the NSF consist of equipment maintenance, administrative duties, and in-house and outside training for everything

Use of Open Water Oil Containment and Recovery System (OWOCRS) (USCG Skimming Barrier)


Tow Vessel
Tow Vessel
Barrier Tow Line
621' Barrier
Oil
Skimming Barrier Struts
Pump Float
Transfer Hose Carries Recovered Oil/Water to Tank on Tow Vessel or Barge.
Four-Strut Section of 621' Barrier
Water Line
1 2 3 4 5 6 7 8 9 10
1. Strut
2. Curtain
3. Inflatable Float
4. CO₂ Bottle & Valve
5. Slack Retention Line
6. Main Tension Line
7. Dynamic Bucket Ballast
8. Foam Flotation
9. Pickup Loop
10. Batten Pocket with Batten
Cross-Sectional View

The **Open Water Oil Containment and Recovery System** (OWOCRS) is a floating, fencelike barrier designed to contain and skim oil in moderate sea conditions. This barrier, or boom, extends about 2 feet above and below the surface. It was designed to contain oil in 5-foot seas and winds to 17 knots but may work in more severe weather in certain circumstances. The OWOCRS is generally deployed in a U-shaped configuration—either moored or positioned by boats. A section in the center of the 621-foot OWOCRS is fitted with 6 vacuum hoses attached to a pumping system that allows for transfer of oil from the water to a barge or other containment vessel. The OWOCRS is considered the best boom or barrier system available at this time for containment and recovery operations in the open-sea environment.

from truck driving and engine repair to pollution response equipment deployment and chemical response techniques.

Although chemicals were not involved in the Alton barge case, response to hazardous materials is an area of concern to the NSF. Training for chemical response is intensive, and strike team members practice regularly with self-contained breathing gear and protective suits. Because the level of training for this duty is so high and the consequences of a mistake so great, there is even a specially designated "chemical response team" within each strike team.

Another specialized group within the NSF is the dive team. Located at the Atlantic Strike Team facilities, the dive team assists OSCs by conducting underwater inspections of sunken or damaged vessels. The dive team and the three strike teams, have a wide knowledge of marine mishaps and a great deal of experience in difficult situations. Because of this experience, they are available to assist in non-pollution-related cases such as search-and-rescue and other Coast Guard missions. The NSF is also on call to respond to inland spills at the request of Environmental Protection Agency OSCs.

Life on the Strike Team

When asked what duty on a strike team is like, NSF members provide a wide range of answers. Each man and woman on the various teams has his or her own likes and dislikes, goals, and specialties and interests. There are, however, many things about strike team duty that are constants.

Duty with the NSF involves a great deal of travel. The travel is usually on short notice and for an unknown duration. Travel associated with training, while it is scheduled, can also be extensive.

A great number of pollution incidents result in what are called "spiller cleanups." In a case such as this, the spiller conducts his own cleanup, often by hiring commercial cleanup contractors. The Federal government, sometimes represented by the strike teams, simply monitors to ensure that the job is done promptly, safely, and in a proper manner.

The situations faced by strike team members are almost always unusual if not dangerous. Individual members are given a great deal of responsibility and may wind up working independently. Even routine monitoring and documentation work sometimes involves many thousands of dollars' worth of equipment and manpower that must be accounted for.

The strike teams are almost always "outsiders," usually being called in to assist on a large or complex case. Occasionally, local Coast Guardsmen and other response personnel have viewed this as a reflection on their ability to handle a situation. That is not the case. The teams are simply extra forces available to help out any fellow Coast Guardsmen who request assistance. They are not sent on cases but rather asked to come by OSCs.

There are still misconceptions about what the strike teams are and what they do. LCDR Tanner mentioned one way to help any Cost Guardsmen who might be considering asking for a transfer to one of the teams. "It would help if people would just call up and ask to talk to someone on the team. They can talk about the different jobs, what it's like to travel so much, and whatever else they're concerned about. That way they would get a feel for what it's really like to be on the team," Tanner said.

What it's really like to be on the team.

"On the road again,
Goin' places that I've never been,
Seein' things that I may never see again,
I can't wait to get on the road again . . ."

REPORT
OIL OR CHEMICAL SPILLS
Call Toll Free
Anytime
800- 424-8802

Title 46, United States Code

The Maze Revisited:

An Update

on the Revision of the Shipping Laws

Editor's note: The June 1981 issue of the Proceedings featured an article entitled "Conquering the Maze: A Proposal for Reorganization of the U.S. Shipping Laws". Requests for copies of this article exceeded available stocks, but reprints have been made and can now be obtained by writing to the editor. The following article describes the steps which the Coast Guard has taken to further its efforts to produce a comprehensive reenactment of those portions of Title 46, United States Code, which it administers.

In the June 1981 issue of the Proceedings of the Marine Safety Council, it was noted that the Justices of the United States Supreme Court once had occasion to refer to the marine safety laws of this country as a "maze of regulation". It was also noted that the Coast Guard had undertaken the task of reorganizing and rewording the hundreds of statutory provisions which come under its administration in a manner which would, to a great degree, straighten out the "maze."

Without a doubt, no area of Federal law is more confusing than that administered by the Coast Guard in its commercial vessel regulation programs. One consequence of the complexity of the law is the difficulty of enforcing it and, perhaps, the difficulty of obeying it. Coast Guard officers new to the commercial shipping regulation specialty require extensive training. Questions frequently arise which require the special expertise of a very small number of agency personnel who, after thirty or forty years' experience, have come to "know" Title 46. A kind of common-sense understanding supported by custom and tradition accepted by the industry has served to avert utter chaos in the administration of these laws, but it cannot be predicted how much longer the strain can be survived.

Because of its complexity, Title 46 has proved to be among the most difficult for Congress to enact as "positive law" (in other words, Congress has had difficulty reenacting the previously enacted statutes into a consolidated, organized title of the United States Code). The first attempt to "codify" Federal shipping law came in 1929, shortly after the adoption of the United States Code. That effort failed for reasons which have now become obscure. A similar effort in the late 1940s also failed. In the early 1960s, the Commandant of the Coast Guard, partially in response to the urgings of the Senate Commerce Committee, assembled a special team of three attorneys to draft in positive law form, without making any "substantive change of a controversial nature," a restatement of Title 46. This group worked diligently for almost three years and, in 1967, presented to the Commerce Committee a draft of "A Bill to Consolidate and Reenact Certain of the Marine Safety and Seamen's Welfare Laws of the United States." The draft received widespread approval and would have placed all of the commercial vessel safety law in a single, easily usable format for the first time in almost one hundred years. However, in the administrative upheaval resulting from the creation of the new Department of Transportation, the bill was scrapped.

Things remained unchanged from 1967 until 1971, when yet another restatement was attempted and eventually shelved. The project was not resumed until the spring of 1980, when the present Commandant designated the redrafting and simplification of the shipping laws one of his "milestone projects." A draft proposal, based largely on the 1967 bill, has now been prepared and is under scrutiny throughout the maritime community.

Two elements in the intended format are worth noting. One is the reorganization of related material into units. An example is the treatment of the Federal Boat Safety Act, which cuts across the areas of safety equipment for recreational vessels, manning of certain commercial passenger-carrying vessels, identification of undocumented self-propelled vessels, and negligent operation of all vessels. The intent to reorganize these matters with others of related or supplementary application is reflected in the proposal.

The other element is the tailoring of language to facilitate both temporary inclusion in the U.S. Code and ultimate assimilation into a truly "codified" title. The substitutions made necessary by non-statutory reorganization plans and other transfers of authority, especially since 1946, have frequently caused confusion in the shipping industry. Terms used in this draft restatement, as well as the internal cross references, have been designed to present the Code editors with the least need for editing and to minimize potentially confusing terminology.

The Coast Guard sought the opinions, cooperation, and assistance of those who would be most affected by the legislative proposal.

The purpose of the current legislative proposal is to make the law easier for the Coast Guard to administer, easier for the maritime community to apply, and easier for everyone to understand. The drafting of the legislative proposal began in earnest in May 1980 at the direction of the Commandant of the Coast Guard and under the guidance of the Chief Counsel and the Chief, Office of Merchant Marine Safety. Using as its foundation a 1967 Commerce Committee print of "A Bill to Consolidate and Reenact Certain of the Marine Safety and Seamen's Welfare Laws of the United States," the drafters proceeded with their task, again under the general guideline that they make no "substantive change of a controversial nature." After eighteen months, a draft proposal was complete. The product divided existing marine safety and seamen's welfare laws into ten clearly defined chapters. It filled three hundred pages of text.

At this point, those close to the project came to understand that they were faced with the awesome task of testing what they had produced against the actual text of the existing shipping laws, knowing that any attempt to bring 108 years of piecemeal Congressional activity into a single, succinct document would invariably result in inadvertent omissions, conflicts, and editorial inaccuracies. The Coast Guard sought the opinions, cooperation, and assistance of those who would be most affected by the legislative proposal.

First, the drafters of the legislation went to the Coast Guard itself. A special panel of three senior and highly qualified officers whose careers had been concentrated in fields related to the regulation of commercial shipping was appointed by Rear Admiral Clyde T. Lusk, Jr., Chief, Office of Merchant Marine Safety, to examine the draft proposal for consistency with longstanding Coast Guard practices and interpretations. For several weeks the panel went painstakingly through the 300-page document, line by line. Once their comments had been evaluated and incorporated into the proposal, a second edition of the draft was produced and distributed to Coast Guard Marine Safety and legal personnel in some of the nation's busiest port cities. Meetings were then held between these persons and the draftsmen to determine whether the proposal was in conformity with the manner in which the law is now being applied by Coast Guard field units. Once the views of Coast Guard field and operational personnel had been obtained, the draft was again updated. At this point the Chief Counsel of the Coast Guard was confident that he had produced a draft proposal which accurately reflected the manner in which the Coast Guard construed and applied the existing provisions of the several hundred sections in Title 46 which come under its administration. However, work was just begining.

The next step was to obtain the views of those people whose commercial and recreational interests were regulated by the federal shipping code.

The next step was to obtain the views of those people whose commercial and recreational interests were regulated by the federal shipping code. A number of industrial groups, labor organizations, shipping companies, trade associations, and law firms were contacted and asked whether they would be interested in participating in the early stages of drafting a way out of the maze. The response was overwhelming. In the weeks that followed, copies of the legislative proposal and supporting documents were delivered to dozens of individuals and groups. As these organizations began their analyses of the proposal, the Coast Guard contacted the prestigious Maritime Law Association of the United States (MLA) and asked for its assistance. The MLA, an organization which has an acute interest in establishing uniform laws, expressed immediate support for the goals of the project through its President, John W. Sims, Esq., of New Orleans.

By the time this article is published, a draft of what is likely the largest single legislative initiative in the Coast Guard's history will have begun its voyage to Capitol Hill.

In November 1981 the Chief Maritime International Law Division at U.S. Coast Guard Headquarters was invited to address the MLA's Committee on Coast Guard and Navigation at its annual meeting in New York. As a result of that meeting and other discussions, dozens of members of the Maritime Law Assocation examined portions of the draft proposal and provided the Coast Guard with their critical comments. On January 20, 1982, a meeting was held at Coast Guard Headquarters in Washington at which interested representives from all areas of the maritime community were invited to comment on the proposal. The substance of comments received up to that point was made known at the meeting. A general description of the intent and purpose of the legislative proposal was offered, and objections and other comments were heard. At the conclusion of the meeting, the Coast Guard began to move rapidly to finalize its legislative proposal.

By the time this article is published, a draft of what is likely the largest single legislative initiative in the Coast Guard's history will have begun its voyage to Capitol Hill. With the Coast Guard's drafting effort drawing to a close, it is appropriate that notice be taken of some of the dozens of individuals and organizations who contributed in a most significant way to the production of a proposal which may in part simplify the "maze of regulation." They are James F. Moseley, Esq., of Jacksonville, Mark O. Kasanin, Esq., of San Francisco, Antonio J. Rodriguez, Esq., of New Orleans, Austin P. Onley, Esq., of Washington, DC, Morton H. Clark, Esq., of Norfolk, George R. Daily, Esq., of New York, E. V. Greenwood, Esq., of Houston; John H. Hanninen, Esq., of Cleveland, Robert B. Preston, Esq., also of Cleveland, Joseph Newton, Esq., of Houston, Raymond T. Letull, Esq., of Philadelphia, Captain T. E. Lohrey, Jr., USN, Force Judge Advocate, United States Pacific Fleet, Charles A. Bedell, Esq., of Houston, George W. Healy III, Esq., of New Orleans, Mr. Bryan Chiasson of the American Waterway Operators, Mr. Ben Webster of the Joint Maritime Congress, Mr. Julian Singman, Esq., of the Maritime Institute for Research and Industrial Development, Rear Admiral W. M. Benkert, USCG (Retired), of the American Institute of Merchant Shipping, Mr. Edward H. Middleton of the Maritime Institute for Resource and Industrial Development, Mr. Frank Pecquex of the Seafarers International Union, Arthur Abarbanel, Esq., and Donald L. Sapir, Esq., of New York, Mr. James L. Henry of the Transportation Institute, Mr. Elwood Hampton of the National Maritime Union, Ms. Barbara Bristilo of the AFL-CIO Maritime Committee, and Ms. Mel Hall-Crawford of Crowley Maritime Corporation. A special note of thanks to Gordon W. Paulsen, Esq., and Kenneth H. Volk, Esq., of New York for their efforts to make the comments of the membership of the Maritime Law Association available to the Coast Guard.

Merchant Marine Registry and Seaman Certification Statistics Fiscal Year 1981

Original Merchant Mariners Documents Issued

QUARTER	ATLANTIC COAST	PACIFIC COAST	GULF COAST	GREAT LAKES REGION	TOTAL
1st—October - December	997	689	1,973	346	4,005
2nd—January - March	1,033	746	1,896	472	4,147
3rd—April - June	1,658	1,245	1,913	503	5,319
4th—July - September	946	1,122	1,738	463	4,269
TOTAL	4,634	3,802	7,520	1,784	17,740

Original Certificates of Registry as Staff Officers Issued

	ATLANTIC COAST	PACIFIC COAST	GULF COAST	GREAT LAKES REGION	TOTAL
Chief Purser	8	5	1	0	14
Purser	5	6	1	0	12
Senior Assistant Purser	2	3	0	0	5
Junior Assistant Purser	6	48	0	0	54
Surgeon	1	16	0	0	17
Professional Nurse	4	2	0	0	6
Marine Physician	0	0	0	0	0
Radio Officer	3	0	2	2	7
Others	0	0	0	0	0
TOTAL	29	80	4	2	115

Original and Additional Endorsements Issued

	ATLANTIC COAST	PACIFIC COAST	GULF COAST	GREAT LAKES REGION	TOTAL
AB—any waters, unlimited	295	191	270	126	882
AB—any waters, 12 months	255	117	381	82	835
AB—Great Lakes, 18 months	183	39	122	31	375
AB—other	53	84	107	9	253
Lifeboatman	711	315	142	57	1,225
Electrician	77	81	33	18	209
Oiler	319	198	77	63	657
Fireman/Water tender	302	146	47	60	555
Other Q.M.E.D. ratings	799	678	129	112	1,718
Tankerman	388	181	590	765	1,924
Entry Ratings and Steward's Department	6,397	4,864	6,365	1,198	18,824
TOTAL	9,779	6,894	8,263	2,521	27,457

Rear Admiral Clyde Thomas Lusk, Jr.
Chief, Office of Merchant Marine Safety

Clyde Thomas Lusk, Jr., was born on December 20, 1932, in Medford, Massachusetts. His family later moved to Milford, New Hampshire, where he attended and graduated from Milford High School. He then entered the United States Coast Guard Academy in New London, Connecticut, and graduated in 1954 with a Bachelor of Science Degree and a commission as Ensign.

His earliest assignments were as First Lieutenant on the United States Coast Guard Cutter DUANE (1954 - 1956) and Operations Officer on the United States Coast Guard Cutter EVERGREEN (1956 - 1957).

His first shore assignment was as Commanding Officer of Loran Station Spruce Cape in Kodiak, Alaska. In 1959 he was transferred to the Marine Inspection Office in Long Beach, California. He was subsequently transferred to Coast Guard Headquarters in Washington, DC, where he served on the staff of the Office of Merchant Marine Safety.

In 1965 he was assigned to marine industry training with the American Waterways Operators, Inc. Upon completion of training he was transferred to the Marine Safety Office in St. Louis, Missouri, where he served as Executive Officer and later as Commanding Officer. His next transfer brought him back to Washington, where he served first as a member of the Planning Staff of the Office of Merchant Marine Safety, then as Assistant Chief of the Merchant Vessel Inspection Division, and then as Director of Transportation Energy Policy on the staff of the Secretary of Transportation. In 1974 and 1975 he attended the Industrial College of the Armed Forces in Washington, DC. Upon completing his studies, he was transferred to New Orleans, Louisiana, where he served as Commanding Officer of the Marine Inspection Office and, subsequently, Chief of Operations of the Eighth Coast Guard District. He returned to Headquarters in 1980 to serve as Deputy Chief of the Office of Merchant Marine Safety.

Following is a resume of his appointments in rank:

- Ensign, May 1954
- Lieutenant (junior grade), December 1955
- Lieutenant, September 1958
- Lieutenant Commander, March 1965
- Commander, March 1970
- Captain, May 1974
- Rear Admiral, July 1981

Rear Admiral Lusk's medals and awards include: the Coast Guard Meritorious Service Medal (awarded twice), the Secretary's Award for Service—Silver Medal, the Coast Guard Commendation Medal, the Coast Guard Achievement Medal, a Letter of Commendation from the Commandant, the Coast Guard Unit Commendation Medal, the Expert Rifle and Pistol Medals, and the National Defense Medal.

Mrs. Lusk is the former Beverly J. Tasko of Wethersfield, Connecticut, a graduate of Connecticut College for Women. The Lusks have six children: Joan Elaine, Gaile Marie, Lois Elizabeth, Mark Thomas, Lori Ann, and John Edward. Admiral and Mrs. Lusk live in Arlington, Virginia.

Chemical of the Month

Vinylidene Chloride: CH_2CCl_2

synonyms:	1,1-Dichloro-ethylene VDC VCl_2
Physical Properties	
boiling point:	31.6°C (88.9°F)
freezing point:	-122.5°C (-188.5°F)
vapor pressure at 20°C (68°F):	495 mmHg
Threshold Limit Values (TLV)	
time weighted average (TWA):	10 ppm
short term exposure limit (STEL):	20 ppm
Flammability Limits in Air	
lower flammability limit:	7%
upper flammability limit:	16%
Combustion Properties	
flash point (open cup):	-15°C (5°F)
autoignition temperature:	570°C (1058°F)
Densities	
liquid (water = 1.0):	1.21
vapor (air = 1.0):	3.4
Identifiers	
U.N. Number:	1303
CHRIS Code:	VCI

Mention of vinylidene chloride (VDC) first appeared in scientific literature in 1838. By the late 1920s and early 1930s, scientists were seriously experimenting with the chemical and it was no longer considered a "strange new fluid." What made it so interesting to scientists was its ability to "polymerize," that is, form larger molecules through the joining of the individual molecules, or "monomers". VDC can polymerize with itself and also with monomers of different types, yielding copolymers. The commercially important copolymers of VDC have been given the trade name "Saran".* Their impermeability to a wide variety of gases and liquids makes them an ideal material for latexes, fibers, films ("Saran Wrap"), and resins. Resins, because of their chemical resistance and resistance to wear, play an important role in the plastics industry, where they are used in molding operations. Lacquers made from VDC resins are used as coatings for board and paper products, especially in the food industry, where their resistance to fats, oils, and water vapor and their nontoxicity, to mention a few features, make them highly desirable for packaging.

For all its usefulness, VDC has many serious hazards which require that the persons handling it be thoroughly educated. VDC is thermally unstable; in other words, if it gets too hot, it will start to polymerize uncontrollably. The Coast Guard and the U.S. Department of Transportation require that VDC be inhibited for shipment, i.e., that a chemical be added to inhibit uncontrolled polymerization. When carried onboard vessels in bulk, VDC must be covered by an inert gas padding. That type of padding is generally used when VDC is shipped in packages, as well. This prevents contact with air and the resulting formation of peroxides, which are shock-sensitive and could explode. When protected from contact with air (more specifically, the oxygen in air), water, and light, the VDC is stable and can be easily and safely transported or stored.

If VDC, which is extremely flammable, is involved in a fire, proper respiratory protection must be worn by those fighting the fire. A positive-pressure self-contained breathing apparatus approved by the National Institute for Occupational Safety and Health and the Mining Safety and Health Administration (formerly the Mining Enforcement and Safety Administration) is recommended. The products of combustion in VDC fires include hydrogen chloride, a highly toxic and corrosive gas. VDC vapor is itself toxic and highly volatile; because of its "sweet smell," however, people often overlook the danger. Exposure to high concentrations of the vapor can produce irrational behavior, "drunkenness," unconsciousness, and even death. Victims of exposure should be removed to fresh air. If breathing has stopped, artificial respiration should be given immediately. Medical help should be sought without delay. Speedy and complete recovery from the anesthetic effects of the vapor depends on quick response.

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*Registered trademark, Dow Chemical Company

Inhibited VDC, which itself is irritating to skin and eyes, can present an additional health hazard if it is allowed to evaporate after spilling or splashing onto the skin or into the eyes. The evaporation of the VDC leaves behind the inhibitor, contact with which can cause local irritation or even burns. If inhibited VDC spills or splashes onto the skin, the affected areas should be washed with plenty of soap and water. If the eyes are affected, they should be flushed with copious amounts of water. Medical help should be sought immediately. Anyone who might be exposed to inhibited VDC should wear protective clothing (impervious gloves, an apron, shoes, and goggles or safety glasses with side shields). If the protective clothing is contaminated, it should be removed at once and not used again until thoroughly cleaned. Shoes should be cleaned and allowed to "air" before they are used again. There is evidence that long-term low-level exposure to VDC can produce kidney and liver damage.

If a spill or leak of VDC takes place, all sources of ignition should be immediately secured. The people handling the spill or leak should wear self-contained or air-supplied breathing apparatus, protective clothing, and spark-proof shoes and should use spark-proof tools.

Hazard Evaluation Branch
Cargo and Hazardous Materials Division

Lessons from Casualties

The Coast Guard is developing a Notice of Proposed Rulemaking covering the design, inspection, testing, and operation of cranes used in the offshore oil industry. Among other things, the proposed rules will require either an audible alarm or a device to prevent two-blocking (the striking of the travelling block against the boom crown block) on all cranes used in the offshore industry. It will also suggest minimum operator qualifications for the personnel who are to operate these cranes. The two proposed requirements stem in part from occurrences like the following incident:

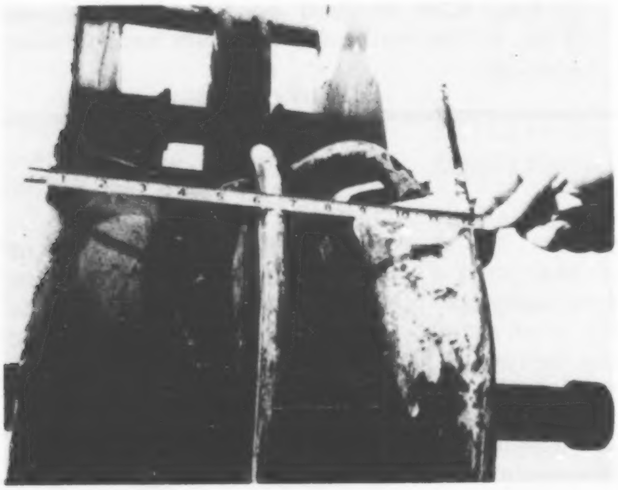
A crane operator recently two-blocked a crane while he was lifting three men in a personnel basket. Two of the men died as a result of the incident. What should have been a routine lift suddenly became a tragedy. The operator, an individual with little more than a year's experience in operating cranes, was making a lift using a type of crane he had operated only three times previously. The crane was a Grove RT-58 secured on a deck barge. The individual was not being supervised. The Grove crane has a telescoping boom, a feature unfamiliar to the operator. His lack of knowledge

The crane operator was unfamiliar with the type of boom used in the Grove RT-58 crane, the telescoped section of which is barely visible at the top of this photograph.

about the consequences of telescoping the boom resulted in his two-blocking the crane, parting the wire rope and dropping a manned personnel basket into the water.

The basket in which the three men were riding was an expanded steel cargo basket about two feet deep, four feet wide, and six feet long. Chains from each corner of the basket led to a single wire sling. The basket was to be hoisted out over a faulty blowout preventer (BOP). One man was to steady the basket, another was to steady the wire rope sling, and the third was to connect the travelling block of a Link-Belt crane from a nearby derrick barge to the BOP. The crane boom was at a 30° angle from the horizontal and at about a 45° angle off the barge's center line. Another worker aboard the barge watched as the crane operator began telescoping the boom outward. This individual, who had had experience with telescoping booms, observed that there were only about ten inches separating the travelling block and the boom crown block, a much shorter distance than is generally considered safe. He turned back to his work, but his attention was soon drawn by a loud popping noise. The crane operator, his attention on the men in the basket, had continued to extend the boom. The travelling block had struck the boom crown block, and the loud popping noise was made by the parting of the cable.

The basket fell 35 feet into the water. One of the men surfaced immediately and was not injured. The second surfaced thirty seconds later and was pulled aboard the barge alive but breathing with extreme difficulty and suffering from what turned out to be a compound fracture of his right femur. He stopped breathing three to five minutes after being pulled from the water, and efforts at cardiopulmonary resuscitation were unsuccessful. The body of the third individual was found in the basket, which was discovered resting upside down in the silt on the bottom.



The retaining bar of the boom crown block was bent out of shape by the impact of the travelling block.

While the primary cause of this tragedy was poor crane handling by an operator unfamiliar with the equipment, there were additional factors that might have averted or at least lessened the consequences of the incident. None of the men in the basket was wearing a work vest or PFD of any kind; had they been wearing PFDs, the worker who surfaced after 30 seconds might have surfaced sooner and lived. American Petroleum Institute (API) Recommended Practice T-1 states that personnel should wear a Coast Guard-approved work vest "during all over water transfers . . . and when working near or over the water where there are no handrails."

Had a two-block prevention device or audible alarm been installed, the casualty might never have occurred.

Clarification

The photograph which appeared in the Lessons from Casualties section of the December 1981 issue of the Proceedings was not of the vessel actually involved in the casualty described. The photograph, which was of a much larger supply vessel, was used simply to illustrate the phenomenon of a vessel sinking by the stern. We apologize for any confusion this may have caused.

In describing the incident as "typical of an all-too-common occurrence in the Gulf of Mexico," the author in no way intended to criticize the offshore services industry. He was merely attempting to highlight the problem of overloading so that additional lives might not be lost as a result of similar circumstances. The offshore services industry, in fact, worked with the Coast Guard in developing the regulations mentioned in the postscript paragraph, which are designed to reduce the likelihood of future casualties.

Coast Guard Urges Fishing Vessels and Other Uninspected Vessels to Use EPIRBs

The Coast Guard urges commercial fishing vessels and other uninspected vessels operating more than 20 miles offshore to use Class A or Class B Emergency Position Indicating Radio Beacons (EPIRBs).

The Coast Guard can cite a number of instances when extensive searches for overdue fishing vessels and other uninspected vessels were unsuccessful. In many other cases, craft were found with minimum search effort because they were carrying EPIRBs.

EPIRBs are effective lifesaving devices. Class A and Class B EPIRBs are designed to transmit on 121.5 MHz and 243.0 MHz, both aviation emergency frequencies. Class A EPIRBs are designed to float free and activate automatically when they become waterborne, whereas Class B EPIRBs must be manually activated; otherwise they have essentially identical characteristics. The EPIRB frequencies are guarded by many aircraft in flight. Although this coverage is not complete, use of such EPIRBs has resulted in many saves. Some examples:

December 1, 1978 - F/V FUGITIVE . . . Pacific Ocean . . . Vicinity of San Clemente Island . . . Vessel reported self sinking on VHF/FM . . . Extensive search by Navy and Coast Guard units . . . 2 hours later EPIRB signal detected by Coast Guard helicopter and 3 persons on board rescued from raft.

February 1, 1979 - S/V GYRIN . . . 50 miles southwest of Bermuda . . . Hit by large wave and capsized . . . Activated EPIRB which was detected by passing Navy aircraft . . . Panamanian M/V GERDT OLDENDORF diverted, rescued the two persons on board.

June 4, 1979 - S/V SOLACE . . . Atlantic Ocean . . . 250 miles north of Bermuda . . . Dismasted . . . energized EPIRB . . .Signal detected . . . Located in rain and darkness by Coast Guard C-130 . . . U.S. research vessel OCEANUS diverted to scene, recovered the vessel and 2 persons on board and took them to Bermuda.

July 4, 1980 - F/V MANTA . . . Pacific Ocean, 50 miles north of Kauai . . . Engine out . . . Activated EPIRB . . . Signal heard by passing MAC aircraft . . . Disabled vessel located by Coast Guard C-130 which obtained surface assistance from weapons recovery boat . . . Towed F/V MANTA to Port Allen, Kauai.

April 16, 1981 - S/V CANADIAN GOOSE . . . Caribbean . . . 150 miles northwest of San Juan . . . vessel broken up and 5 people clinging to debris in the water . . . EPIRB reported by passing commercial aircraft, and a Coast Guard HH3 located survivors and hoisted all 5 from the water and transported them to Puerto Rico in good condition. Survivors were in the water for 19 hours before being located.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. Which of the following buoys are used in Vessel Traffic Separation Schemes at the entrances to ports?

A. black and white horizontally banded
B. black and white vertically striped
C. white and international orange, either vertically or horizontally banded
D. red and black horizontally banded

REFERENCE: Bowditch

2. The fore and aft row of deck plating which strengthens the connection between the beams and the frames and keeps the beams square to the shell is called the

A. sheer strake
B. starboard strake.
C. limber strake.
D. stringer strake.

REFERENCE: MMOH 14-5,

3. An inert gas system installed on a tanker is designed to

A. aid in the stripping and cleaning of cargo tanks.
B. increase the rate of discharge of cargo.
C. force toxic and explosive fumes from a cargo tank to vent to the outside atmosphere.
D. lower the oxygen levels inside cargo tanks, making explosion nearly impossible.

REFERENCE: Marton

4. The use of pulse groups and extremely precise timing at each Loran-C station makes possible the use of

A. high-frequency pulses.
B. a combination of high- and low-frequency pulses.
C. the same frequency for all stations in the system.
D. varied long and short pulses.

REFERENCE: Duttons

5. Every vessel should at all times proceed at a "safe speed." "Safe speed" is defined as that speed where

A. you can stop within your visibility range.
B. you can take proper and effective action to avoid collision.
C. you are travelling at a slower speed than surrounding vessels.
D. no wake comes from your vessel.

REFERENCE: Rules of the Road

ENGINEER

1. Compensated flow control valves are used in a hydraulic system to

A. compensate for major leaks in the system.
B. maintain proper hydraulic fluid viscosity.
C. allow for pressure changes in the system.
D. assure constant hydraulic fluid temperature.

REFERENCE: Vickers Hydraulic Manual

2. Which preventive measure is the most practical way of assuring proper operation of a pressure-reducing valve in a hydraulic system?

A. The valve stem should be thoroughly lubricated with graphite and oil.
B. Seals and gaskets should be soaked in a solvent at frequent intervals.
C. The hydraulic fluid should be kept as clean as possible.
D. Personnel should avoid wetting new seals with hydraulic fluid when they are replacing them.

REFERENCE: Vickers Hydraulic Manual

3. If misalignment between a pump and its driving source exceeds that specified by the pump manufacturer, the shaft

A. flexible coupling will absorb all such misalignment.
B. total end float travel will be excessive.
C. lateral float will be greatly increased.
D. bearings will be overloaded and will fail.

REFERENCE: Karassik

4. In a flash-type evaporator, heated water under pressure is converted to vapor by a sudden

A. increase in its temperature.
B. decrease in its velocity.
C. increase in its pressure.
D. decrease in its pressure.

REFERENCE: Harrington

5. The function(s) of the economizer used with multistaged, centrifugal, refrigeration compressors is to

A. cool the discharge vapor from the first-stage impeller.
B. cool the liquids in the economizer chamber.
C. permit some liquid to flash to gas as it passes through the high-side float.
D. all of the above.

REFERENCE: NAVPERS ENG 3 and 2

ANSWERS

DECK
1.B;2.D;3.D;4.C;5.B
ENGINEER
1.C;2.C;3.D;4.D;5.D

Correction

The answer shown for question 5 of the "ENGINEER" Nautical Queries in the November 1981 issue was incorrect. The correct answer is D.

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**United States
Coast Guard**

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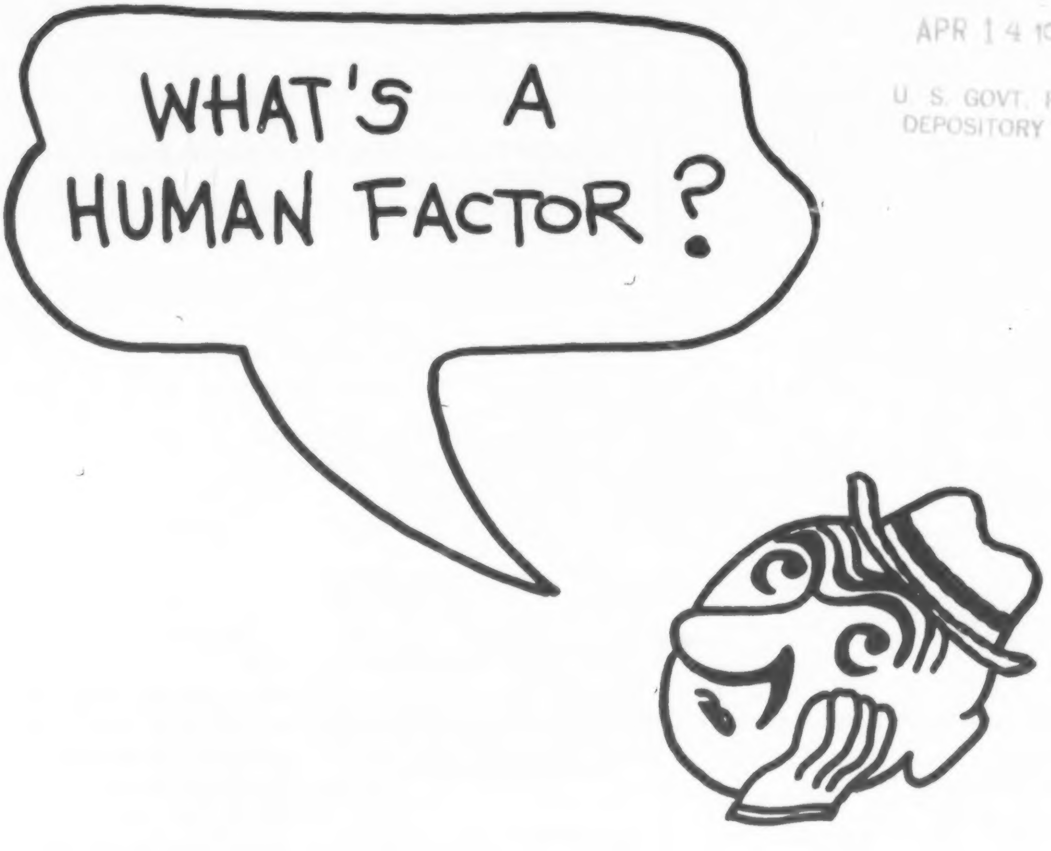
WHAT'S A HUMAN FACTOR?

TD 5.13:

Proceedings
of the Marine Safety Council

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Admiral J. B. Hayes, USCG
Commandant

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Commander A. D. Utara
Executive Secretary

Julie Strickler
Editor

DIST. (SDL No. 115)
A: acde(2); fghklmntuv(1)
B: n(50); c(16); e(5); f(4); gj(3); r(2); bkiq(1)
C: eglmp(1)
D: adgklm(1)
E: mn(1)
F: abcdehjkloqst(1)
List TCG-06

When you have finished reading this issue, please pass it on.

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cover

"Human factors" is a broad subject area which covers everything from the role of human error in casualties to the need to design ships and their equipment with the human operator in mind. This month's Proceedings *features four articles on the subject, beginning with "Shipboard Fire: No Time for a Coffee Break" on page 105.*

Letters to the Editor

After reading "Close Encounters of a Dangerous Kind" in the September/October 1981 issue, I feel compelled to offer my opinion. As a Tug Boat Captain in Port Everglades, Florida, I had to accept the fact that "close encounters" are a routine part of my job.

I don't believe that recreational boaters are intent on injuring or killing themselves or their families, nor do I believe that they have a vendetta against ships and tugs. Often after a dangerous incident has just occurred, they placidly sail away, completely unaware of the danger they have placed themselves in and the destruction they came very close to causing.

In the process of docking or undocking a ship, a tug must shift sides and reposition while the vessel is moving, and there are numerous variables involved. The tug should not be required to play Dodge 'em Boats with small recreational craft in that process. Maneuverability is often limited, and the tug and the vessel working together are extremely dependent on each other. A small recreational boat often limits maneuvering space even further and increases response time while the tug has to go around him to avoid him. The boater not only endangers himself but also the vessel, which in many cases contains volatile cargo, a potential catastrophe.

To help avoid these situations, more stringent requirements should be initiated to ensure that any boat operator, whether under power or sail, knows the Rules of the Road. What good are day signals, towing lights, etc., if only the maritime industry people know these rules? If we were the only ones sharing the waterways and oceans that would be fine.

Consider what it would be like if only a portion of the drivers on our highways had licenses or only a portion of airplane pilots had licenses. Gives a person something to think about, doesn't it?

Captain Richard Decker
Stuart, Florida

Every boating accident and even your excellent article "Close Encounters of a Dangerous Kind" in the September 1981 issue brings out a demand for licensing pleasure boaters. An alternative is to require that pleasure boaters have a Pleasure Boat Safety Manual aboard, approved or sold by the U.S. Coast Guard. When I sailed in Europe, I found this to be very practical. Bored crewmembers and especially kids loved to browse through the very colorful waterproof manual. Skippers would settle their arguments or enforce their threats by yelling "look at page so-and-so." Unfortunately the government and the U.S. Coast Guard have contributed to ignoring boating regulations by publishing laws, regulations, and brochures that cannot be understood by 12-year-old kids or 99 percent of the pleasure boaters. Knowing, however, that the government has the habit of publishing navigation and piloting handbooks containing enormous amounts of noncritical information that cannot be reread when [one is] entering an ominous nautical situation and formatting the books so large that they do not fit on most bookshelves of pleasure yachts, [I feel] the results may be nullified. The manual would have to be approved by most boating organizations and be of pocket size to get some assurance of quality and benefit to the pleasure boaters and mariners.

Henry Bernaerts
Annapolis, Maryland

Maritime Sidelights

Coast Guardsman Honored by Rescue Association

Seaman John C. D'Ornellas of the U.S. Coast Guard has been awarded the Association for Rescue at Sea's Gold Medal for rescue at sea. The award was presented by the association's president, VADM D. D. Engen, USN (Ret.), at ceremonies held at the Russell Senate Office Building in Washington, DC, on February 4.

D'Ornellas was a crewman on board a Coast Guard 44-foot motor lifeboat stationed at Winchester Bay, Oregon, when it went to the rescue of the fishing vessel GAIL off the Umpqua River Bar November 21, 1980. Because of 15- to 20-foot breaking seas on the bar, the fishing boat began to

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The award to Seaman D'Ornellas (center) was presented by VADM Engen (left). Looking on is ADM J. B. Hayes, Commandant of the Coast Guard. Photo by PA3 Peter Grossetti

take on water before the lifeboat could escort it back to port. When the lone person on board the stricken vessel radioed that he had lost his autopilot, D'Ornellas volunteered to go on board to secure an open hatch and help steer. After several attempts to reach the fishing boat, D'Ornellas was able to leap from the 44-footer to Gail's afterdeck.

Even though the hatch was secured once, it broke free again, and the GAIL began to take on more water. Pumps were lowered from a helicopter, but they were quickly washed overboard. Then waves began breaking through the wheelhouse windows, and the inrush of water shorted out the radio. D'Ornellas knew that the fishing boat couldn't last much longer and persuaded the fisherman to abandon his boat and swim for the motor lifeboat that was standing a short distance away. The two men were retrieved by the lifeboat moments later.

D'Ornellas is the second person to be presented with the Gold Medal by the association, which was formed in 1976 to promote rescue at sea.

NFPA Now Accepting Proposals

The National Fire Protection Association (NFPA) is accepting proposals for changes in NFPA 306, the Control of Gas Hazards on Vessels. A report on the changes will be delivered by the NFPA's Technical Committee at the association's 1983 fall meeting.

Proposals will be accepted until July 23. They must be submitted on a required form, which may be obtained by contacting Charles L. Keller, Marine Field Service Specialist, NFPA, Batterymarch Park, Quincy, MA 02269.

MariChem 82 to be Held in Amsterdam

Key issues affecting chemical shipping and distribution will be discussed at the MariChem 82 Conference in Amsterdam June 22 - 24. The areas of concern to shipowners and port operators are reflected in the subjects of the conference sessions:

- Legislation and regulation
- The inert gas issue
- Operations
- Environmental protection
- Technical developments

The conference is the fourth in the series and follows the 1980 meeting in London. Full details of the program of speakers, exhibition participants, and technical tours can be obtained from the MariChem Secretariat at 2 Station Road, Rickmansworth, Herts WD3 1QP, England; tel.: Rickmansworth (09237) 76363, telex: 924312.

Hazardous Cargo Carriers Sought

Under contract with the Coast Guard, Goodyear Aerospace Corporation conducted a study to determine the feasibility of developing and using portable containers to offload hazardous chemicals at sea.

Floating, flexible, rubberized fabric containers are currently used for storing and transporting oil recovered from damaged oil tankers and barges. This same type of container would be useful in responding to hazardous chemical spills.

The ideal situation would be to have a common container for both oil and chemicals. However, many chemicals are heavier than water and can damage the existing flexible oil containers. For these reasons, less than half of the chemicals identified in the Coast Guard List of Hazardous Chemicals can be carried in existing flexible containers.

Goodyear Aerospace, which investigated different fabrics and construction techniques, came to the preliminary conclusion that a container could be built to carry 90 percent of the listed hazardous chemicals. Copies of the report, "Hazardous Chemical Container Feasibility/Concept Design Study," can be obtained by requesting Report No. CG-D-05-82 from Commandant (G-DMT-4), U.S. Coast Guard, Washington, DC 20593.

New System Measures Pollution

The Coast Guard's Office of Research and Development has just released a report on the capabilities of an experimental system to monitor marine pollution. Measurements made by the system may be used to identify oil and other hazardous chemicals in the ocean or waterways.

The system consists of an underwater sensing device or "fluorometer," a shipboard controlling and monitoring unit, and a tow line and electrical cable connecting the two. In operation, the fluorometer is towed through the water, sampling the water for the presence of certain hazardous chemicals and transmitting this information to the shipboard unit. The system measures six different characteristics simultaneously.

The system has had an initial at-sea tryout on board the USCGC EVERGREEN. During this test, the basic design was evaluated, but no attempt was made to determine the sensitivity or accuracy of the system.

The report describes the construction, calibration, and operating procedures of the system. Copies of "Hazardous Chemical Fluorometer Development" can be obtained from Commandant (G-DMT-4), U.S. Coast Guard, Washington, DC 20593.

Underwater Inspections Studied

A recently completed study by the Office of Research and Development examined the feasibility of inspecting and even repairing vessels while they remain afloat.

For merchant vessels that require certification by the Coast Guard, a thorough inspection is generally performed every two years. Traditionally, the inspection has required drydocking, which can tie up the vessel, shipyard facilities, and Coast Guard inspectors for a considerable time.

The project's final report concluded that trained people using the latest in underwater inspection equipment could perform an inspection with the ship or structure still afloat. In the report, whose findings also have application to offshore drilling rigs, underwater pipelines, and other partially or fully submerged structures, known underwater inspection problems are presented along with means to overcome them. Most of the major underwater repair techniques are discussed. Illustrations and data on the products available to perform underwater inspections are also included.

Copies of the report, "Drydock Extension: A 1980 Underwater Technology Survey for Extension of Time Between Drydockings," can be obtained from the National Technical Information Service, Springfield, Virginia 22161, by specifying Report No. CG-D-15-81, Accession No. AD-A101131.

Keynotes

The following items of general interest were published between January 22, 1982, and February 22, 1982:

Final rules: CGD 82-003 Drawbridge Operation Regulations; Sioux City, Iowa, Revocation, January 25, 1982. CGD 3-81-1A Anchorage Grounds, Port of New York and Vicinity, January 25, 1982. CGD 12-81-100 Drawbridge Operation Regulations; Dutchman Slough and Sacramento River, California, January 28, 1982. CGD 81-054 Drawbridge Operation Regulations; Saginaw River, Michigan, January 28, 1982. CGD 80-106 Drawbridge Operation Regulations; Taylor Creek, Florida, February 1, 1982. CGD 5-81-11R Drawbridge Operation Regulations: North Landing (AIWW), Virginia, February 1, 1982. CGD 81-025 Drawbridge Operation Regulations; Kennebec River, Maine, February 1, 1982. CGD 1-80-9R Establishment of Special Anchorage Areas in Boston Inner Harbor, Boston, Massachusetts, February 11, 1982. CGD 5-80-22R Drawbridge Operation Regulations, Strong Creek, Maryland, February 22, 1982. CGD 17-81-03R2 Safety Zone, Gastineau Channel, Alaska, February 22, 1982. CGD 81-008 Annex I to Inland Navigation Rules, Correction, February 22, 1982. CGD 81-006 Annex II to Inland Navigation Rules, Correction, February 22, 1982. CGD 81-009 Annex III to Inland Navigation Rules, Correction, February 22, 1982.

Interim final rule: CGD 81-087 Disestablishing of COLREGS Demarcation Lines for Puget Sound and Adjacent Waters of Northwest Washington, Correction, January 25, 1982.

Notices of proposed rulemaking (NPRMs): CGD 81-107 Drawbridge Operation Regulations; Snohomish River, Steamboat Slough, and Ebey Slough, January 28, 1982. CGD 7-82-01 Drawbridge Operation Regulations, Garrison Channel, Florida, January 28, 1982. CGD 81-099 Drawbridge Operation Regulations; Corte Madera Creek, California, February 8, 1982. CGD 11-80-08 Anchorage Grounds, Los Angeles and Long Beach Harbors, California, February 8, 1982. CGD 79-173 Temporary Licenses and Endorsements, Withdrawal of Proposed Rule, February 11, 1982. CGD 5-81-16R Anchorage Regulations, Northwest Harbor, Baltimore, Maryland, February 18, 1982.

Notices: CGD 82-008 Security and Safety Zones; Notice of Temporary Zones Issued, February 1, 1982. CGD 82-007 Memorandum of Understanding, Coast Guard and Environmental Protection Agency, February 1, 1982. CGD 82-011 Notice of Qualification of SIBO, Kentucky, Incorporated, as Citizen of the United States, February 4, 1982. CGD 82-009 IALA Maritime Buoyage System, Notice of Meeting, February 8, 1982. CGD 82-014 Towing Safety Advisory Committee, Notice of Meeting 10 - 11 March 1982, February 18, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Obsolete Load Line Regulations Revoked
CGD 80-120

In the early days of the shipping trade, ship owners would sometimes attempt to maximize their profits by dangerously overloading their ships. This would cause the ship to ride lower in the water, making it less stable in heavy seas and causing many casualties.

In the 19th Century the English required ships to inscribe marks on their sides to show the limit to which the ship could be safely loaded for different seas and seasons. Around 1930, the U.S. began adopting load line standards, the regulations for which were contained in Title 46 of the Code of Federal Regulations, Part 43 (46 CFR 43). In July 1968, a worldwide load line convention went into effect, superseding older conventions. The intent was to bring load line regulations up to date with modern ship construction developments and techniques. In some cases deeper loading of ships can now be safely permitted. The regulations promulgated from this convention appear in 46 CFR 42. The Part 43 load line regulations were retained at the time for vessels whose keels were laid before July 1, 1968. Since all vessels whose keels were laid after that date must comply with the Part 42 regulations and since Congress in 1973 repealed the statute authorizing the Part 43 regulations, the older regulations became obsolete. On February 1, 1982, the Coast Guard published a final rule revoking the Part 43 load line regulations and making authority citation corrections and editorial changes related to this revocation. A vessel whose keel was laid before July 1, 1968, may retain its original Part 43 load line, as long as the vessel is not significantly altered or has not been assigned a reduced freeboard (which would affect its original load line assignment).

Freeboard Assignment Revisions Proposed
CGD 79-153

The Coast Guard is proposing to amend the load line regulations by revising the subpart concerning the assignment of freeboards. This revision is based on Inter-Governmental Maritime Consultative Organization (IMCO) resolution A.320(IX), which is considered equivalent to Resolution 27 of the International Load Line Convention, 1966. The proposed regulations would simplify the assignment of freeboards by clarifying the language and improving the format of the existing requirements. This would not create any substantive changes to the existing regulations but would help make them clearer and easier to use.

The NPRM concerning freeboards was published February 4, 1982. A correction document to the NPRM was published February 18, 1982, since an appendix to the regulations was inadvertently omitted from the original document. For further information on this proposal, contact Mr. William Cleary, U.S. Coast Guard (G-MMT-5/12), Washington, DC 20593.

Final Rule Issued for Electronic Position Fixing Devices
CGD 81-081

As of June 1, 1980, all vessels 10,000 gross tons or more were required to carry electronic position fixing devices. Vessels 1,600 to 10,000 gross tons will be required to carry this equipment on June 1, 1982. Under current requirements, acceptable electronic position fixing devices include Loran-C Type I or II receivers and hybrid satellite navigation receivers which contain an integrated continual tracking complementary system. Examples of hybrid systems are satellite-OMEGA, satellite-Loran-C, and satellite-doppler systems. The complementary tracking systems were required because it was felt that, with conditions of significant set and drift (tidal current effects on a ship), an error in position reading could occur between usable satellite passes.

The Coast Guard, however, assuming that a prudent mariner would not rely on any one position source, would consider accepting the use of "stand-alone" satellite navigation receivers. Grounding statistics for vessels with "stand-alone" satellite navigation receivers were reviewed and showed no groundings occurring on vessels with "stand-alone" systems. As a result of this finding and the Coast Guard's desire to make further studies, the requirement for complementary tracking systems has been delayed. Vessels having a satellite navigation receiver installed before June 1, 1984, need not install a complementary tracking system until June 1, 1987. Vessels having a satellite navigation receiver installed on or after June 1, 1984, must have a complementary system installed concurrently. After the additional review of groundings and satellite navigation systems is conducted, a notice will be issued proposing the elimination of the requirement for complementary tracking systems, if feasible.

The final rule delaying the dates for required complementary tracking systems was published February 11, 1982. For further information, contact Mr. Tom Falvey, U.S. Coast Guard (G-WWM-2), Washington, DC 20593.

Great Lakes Pilotage Rates Revisions Proposed
CGD 81-088

The Coast Guard has completed a review of revenues collected and expenses incurred by three Great Lakes pilot organizations during 1981. The review indicated that revenues received by pilot organizations need to be increased to cover increased operating costs. While traffic has decreased, the costs of providing pilotage services have not, because many of the pilot association costs are fixed costs.

This proposed rule would increase the basic pilotage rates by 9 percent in the U.S. Great Lakes pilotage system and eliminate the smallest category in the "range of pilotage units" table. Pilotage units are determined by a formula taking into account length, breadth, and depth of a ship. Ranges of pilotage units are assigned a certain weighting factor, which, when multiplied by the basic pilotage rate, determines the rate a vessel pays for pilotage service. If the lowest range of pilotage units (0 - 99 pilotage units, weighting factor .85) is eliminated and that range combined with the next lowest range (100 - 129 units, weighting factor 1.00), pilot revenues will increase by an additional 1.5 percent.

The proposal would also allow temporarily registered pilots to hold stock and other financial interests in pilot organizations. The primary purpose of this provision is to allow pilots over the age of 70, who would otherwise have to retire because of age, to assist pilot organizations by sharing the benefits of their experience and possible managerial capabilities.

The NPRM was published on February 11, 1982. For further information, contact Mr. John J. Hartke, U.S. Coast Guard (G-MVP-4/14), Washington, DC 20593.

Effective Date for New Inland Rules Announced for Great Lakes
CGD 82-012

The new unified navigation rules went into effect on December 24, 1981, in all areas of the U.S. except the Great Lakes. The effective date for the Great Lakes was delayed to accommodate Canadian legislation paralleling the new U.S. inland rules so that both sets of rules would become effective at the same time. At the recommendation of the Canadian government, the rules will become effective on July 1, 1982.

The notice establishing the effective date was published February 8, 1982. For further information, contact CAPT James Montonye, U.S. Coast Guard (G-NSR-3), Washington, DC 20593.

* * *

Actions of the Marine Safety Council

January Meeting

CGD 77-084 Licensing of Pilots (Supplemental NPRM)

As a result of the Port and Tanker Safety Act of 1978, an NPRM was published in the Federal Register on November 28, 1980, containing changes to the pilot licensing regulations. The resulting comments, both written and those received during the various public hearings, indicated a need to make substantive changes to the NPRM. The supplemental notice proposal includes the following modifications:

1. The number of round trips required for license renewal will be determined at the local OCMI level.
2. Tonnage limitations are deleted.
3. Refamiliarization trips will fulfill recency of service requirements.
4. Simulator training requirements are deleted.
5. Physical examination reporting requirements are amended.

The Council voted to forward the supplemental NPRM to the Commandant with a recommendation for approval.

The Council approved the following work plans:

CGD 78-151 Inland Waterway Navigation Regulations

This project would revise and update the navigation regulations for the connecting waters from Lake Huron to Lake Erie, including the Rouge River. An NPRM should be published this spring.

CGD 81-101 Implementation of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973

On October 21, 1980, the Act to Prevent Pollution from Ships was signed into law. This act authorized development of regulations to implement Annex II. An advance notice of proposed rulemaking (ANPRM) is scheduled to be published in December 1982.

CGD 81-103 Fairways off the Southern Coast of Alaska

The Port Access Route study required by the Ports and Waterways Safety Act indicated a need for shipping safety fairways at the approach to Prince William Sound and through Unimak Pass. An NPRM will be submitted in June.

February Meeting

The Council approved the following work plans:

CGD 82-001 Numbering Fees

There is a need to eliminate the present inequity between numbering fees for undocumented vessels in states that administer their own numbering system and those in states in which the Coast Guard administers the system. This project would increase the fees for those states under Coast Guard administration. An NPRM should be published in June.

CGD 82-002 Suspension and Revocation Proceedings

The last major revision of 46 CFR 5 was completed in 1962. Another revision is now necessary to incorprate new policies, correct inaccuracies, and make changes dictated by legislative actions which are not currently reflected in the regulations. An NPRM will be published in June.

CGD 82-004 Offshore Supply Vessel Regulations

The Small Vessel Inspection and Manning Act (Public Law 96-378) requires, among other things, that Offshore Supply Vessels comply with Coast Guard inspection regulations. This proposal will develop regulations which consider the special characteristics of Offshore Supply Vessels, their operating methods, and the service in which they are engaged and will apply only to those vessels constructed on or after the effective date of the regulations. An ANPRM will be published this summer.

CGD 82-005 Inspection of Subchapter "D" and "O" Tank Barges

This project will:

1. Remove the conflict in internal and external examination intervals;
2. Reduce the financial burden of gas-freeing barges for the sole purpose of conducting redundant inspections;
3. Reduce the frequency of entry into confined spaces.

An NPRM will be published in June.

Shipboard Fire:
No Time For a Coffee Break

by LCDR C. F. Guldenschuh
Chief, Commercial Vessel Safety Branch
Marine Safety Division
Ninth Coast Guard District

There can be no doubt that the Great Lakes Fleet has been swept up in the revolution of ship design and construction. Over the past several decades, technology has provided a great many improvements in the structural design of the modern vessel as well as its hardware. This new breed of ship is demanding a new breed of seafarer. The traditional yardsticks applied to seafarers are rapidly becoming a thing of the past.

For the last decade, at least, the industry and government regulators have attempted to make ships "sailorproof." This has resulted in a great many tools being developed to aid the mariner, but unless the seafarer can properly use these tools, they are worth absolutely nothing. A hard lesson has perhaps finally been learned: there is no black box that can replace qualified seafarers. Marine safety is vitally dependent on the human factor. The need to properly address the human factor is now being recognized both internationally and domestically. We have begun to realize how much a seafarer's ability to effectively function on board a modern vessel hinges not only on his training and his experience but also on his professional attitude. Perhaps this is one area we can all readily improve upon.

One way of determining how we can improve our future safety record is by seeing how we have done in the past. A review of past casualties on the Great Lakes will reveal that over 80 percent of them have been attributable to the human factor. I would like to demonstrate the negative side of the human factor in marine safety—in this particular case, vessel fire safety—by narrating a brief history of a casualty that should never have occurred.

Prelude

On December 16, 1979, a motor vessel 513 feet long, of conventional Great Lakes design, arrived at Toledo, Ohio, for winter lay-up. The vessel in question was one of the first Great Lakes vessels to be converted to a self-unloader and also had a relatively new engine room section. There were no major changes made to its forward deckhouse during conversion, and much of that deckhouse was constructed of wood. The vessel was built before most of the current structural fire protection standards and practices had come into being. On the morning of December 17, 1979, the master and all deck department personnel departed the vessel for the winter lay-up period. The Chief Engineer

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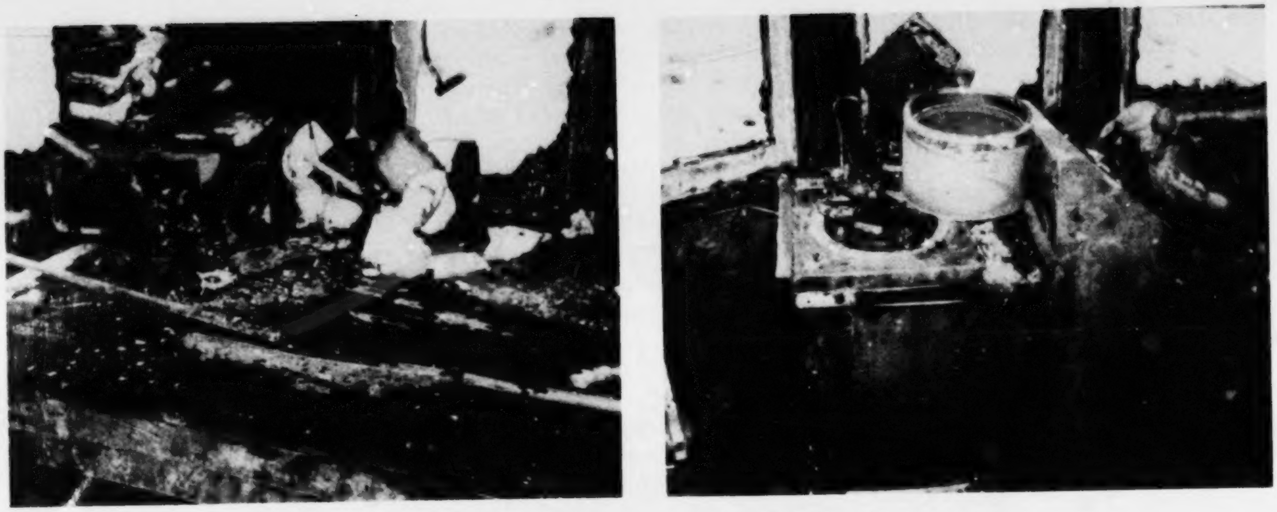


The fire that need not have occurred caused millions of dollars' worth of damage.

and his department personnel remained on board to take care of routine winter maintenance items. On December 17, the Engineering Department began routine lay-up chores. These included the draining of all steam and water lines to the forward end of the vessel, the opening of valves in these lines, and the opening of the fire and general service pumps. These routine winter precautions against freezing eliminated any immediate fixed firefighting protection for the forward end of the vessel.

> **The human factor is the most complicated and often the most unpredictable factor in the [safety] equation.**

The Casualty

On December 26, the Chief Engineer assigned the task of renewing the port crossover-belt to a conveyorman and two gatemen. The next three days were used to move the belt, stowed on a reel and protected by cardboard material, from the storage location to a position between the port and starboard crossover conveyors. Early on the morning of the 29th, the three men began preparations to install the new belt. They discovered shortly that the new belt would not fit between the belt scrapper and the roller drum.

The conveyorman then decided it would be necessary to burn the scrapper bar off to install the belt (a new scrapper bar could be installed later). The burning operation was begun without delay and without the taking of any special fire precautions. Neither the new belt nor any of the cardboard packing material was removed from the immediate area.

At approximately 1330, the burning operation had been completed and the old scrapper bar removed. At this point, it was noticed that white smoke was coming from the hopper below the area where the burning had taken place. From the smell of the smoke it did not appear to be burning rubber. Since there was no fire protection in the area, the conveyorman went in search of the nearest portable fire extinguisher, which was located one deck above.

When he returned to the scene, a gateman took the extinguisher, which was a 15-pound B-II CO$_2$ bottle, and crawled a short distance down the inclined belt toward the tanktop. He reported that he could see the cardboard material burning. After giving the fire "two good shots" from the CO$_2$ extinguisher, he watched the flames disappear. He then gave the area one more "good shot" and returned to where the other two men were waiting. The three seafarers made no further efforts regarding the fire. They waited in the area about three minutes and were satisfied that the fire was out. They then proceeded to the spar deck and then aft to have coffee and wait for the area to clear of smoke. The time was approximately 1345.

The two gatemen proceeded to the galley

for coffee, and the conveyorman proceeded around the afterhouse looking for the Chief Engineer to inform him of the situation. Upon returning to the forward side of the afterhouse without locating the Chief Engineer, he noticed black smoke billowing up from the forward end of the vessel. The conveyorman immediately went forward, alone, to re-extinguish the fire. While attempting to reach the work area, he was repelled by the dense black smoke. He then proceeded aft to sound the alarm and alert the crew. The time was approximately 1355.

The ship's crew attempted to put out the fire but failed completely because of its inability to penetrate the thick black smoke pouring out of the area. The Toledo Fire Department was called at 1402. As soon as the alarm was sounded, the Chief Engineer ordered various pumps to be reassembled to remove water used in firefighting from the vessel. Two ship's pumps were returned to service.

At 1410 the Toledo Fire Department arrived on scene. It was unable to combat the fire because of the heavy black smoke and the firefighters' unfamiliarity with the vessel. The fire raged out of control until the early morning hours of December 30. It was finally extinguished at approximately 2200 on December 30.

As a result of the fire, the entire forward deckhouse, including all living areas, storage areas, and the pilothouse, were gutted. The conveyor equipment forward and as far aft as the #10 hopper was completely destroyed. Although there were no injuries or loss of life, the damage to the vessel ran into the millions of dollars.

. . . complacency can be the most dangerous of all shipboard conditions.

Analysis

There can be little doubt that the damage would have been less extensive had the vessel had the type of structural fire protection built into newer vessels. There can also be no doubt that this lack of protection played no part in causing the casualty. The safe and efficient operation of any vessel depends not only on the modern design and technology built into such ships but more importantly on the seafarer—the human factor.

The cause of this casualty was the abysmal breakdown of the human factor. A contributing cause to the casualty was the lack of fixed firefighting capability in the area. It is likely that had there been a charged fire hose strung out to the area where the burning operation was being conducted, this casualty would never have occurred.

What actions of the seafarers caused this casualty? They were:

1. failure to remove combustible materials from the immediate area,
2. failure to have several of the proper class portable fire extinguishers at hand and ensure that everyone was familiar with their proper use,
3. using the wrong type of fire extinguisher in a haphazard manner to attempt to extinguish the fire,
4. failure to overhaul the fire after it was thought to be out,
5. failure to set a reflash watch, and
6. on the part of the conveyorman, failure, after seeing smoke forward, to sound the alarm before setting out to re-extinguish the fire on his own.

Conclusions

There are numerous factors which fit into the total vessel safety equation, but none is more critical than the human factor. The human factor is the most complicated and often the most unpredictable factor in the equation.

It is essential that the experience and training required of the seafarer be constantly reevaluated to ensure that the professional qualifications of the seafarer are kept in step with the times. Just as important is the seafarer's professional attitude. It is the obligation of the seafarer to ensure that his attitude remains as professional as the rest of his qualifications. As can be seen in this casualty, complacency can be the most dangerous of all shipboard conditions.

Safe and efficient vessel operations are impossible if the human factor in the safety equation is not a positive one.

Help for Human Beings--

Vessels like the 250,000-DWT tankship above often have to operate in heavy weather. (Photo courtesy of Frank Mueller-May)

it's Instrumental

by

H. Paul Cojeen
Ship Design Branch
Merchant Marine Technical Division

and

CDR Edward A. Chazal, Jr.
Planning Branch
Plans and Programs Staff

"Ships have never been and probably never will be failureproof . . . We have not adequately recognized the sailors' part in the system . . . The motions of larger ships, which are masked to the human sensations, can be measured by electronic means . . . here's an area [response instruments] which shows promise as a reliable way to back up the sailors' traditional sixth sense . . ."[1]

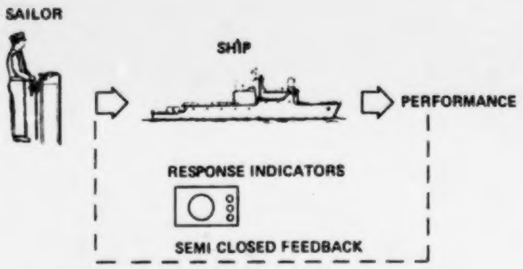
". . . [ship's officers] must realize that in bad weather, as in most other situations, safety and fatal hazard are not separated by any boundary line but shade gradually from one into the other. There is no little red light which is going to flash on and inform commanding officers that from then on there is extreme danger from the weather and that measures for the ship's safety must now take precedence over further efforts . . ."[2]

"Studies of marine casualties . . . verified the suspicions of many of us in the marine safety field that ship design and construction were only a part of the picture. Both people and maintenance were identified as extremely important elements which must be addressed with at least as much attention as was previously paid to the ship itself . . . During my tenure as Chief of the Office of Merchant Marine Safety I've watched with considerable interest the efforts made to solve people problems with equipment fixes. People problems require a greater realm of knowledge than the technical side of our training. They are generally more complex in their origin and normally more intricate in their resolution."[3]

[1] ADM J. B. Hayes, address to American Petroleum Institute, Coronado, California, May 1980

[2] ADM Chester Nimitz, following the loss of three destroyers of Halsey's Third Fleet in a typhoon east of the Philippines on December 17 and 18, 1944

[3] RADM Henry H. Bell, speech at Nor-Shipping, Oslo, Norway, June 1981



SEMI CLOSED LOOP SYSTEM

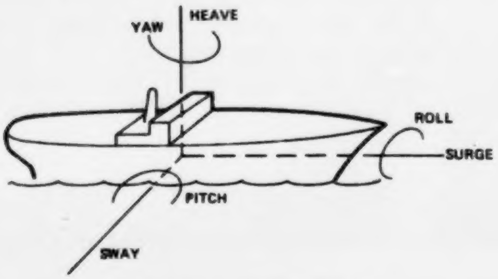
The quotations on the preceding page illustrate a basic theme: the human element, whether it is called human factors, or human engineering, or ergonomics, is the single most important element in the safe operation of our vessels and platforms. Giving a human being supplementary information on those responses of his ship he cannot "feel" can aid him in making prudent decisions.

Thanks to a number of research efforts in the United States, Norway, and the Netherlands, a simple, general-purpose response-monitoring instrument can now be brought to the navigating bridges of LNG and tank vessels, containerships, cargo and passenger vessels, naval combatants, cutters, and patrol boats.

What are (ship) motion responses?

A ship is a floating body propelled by some means over an everchanging water surface. It is subjected to various environmental "loads" (waves, wind, etc.). It is also influenced by self-generated forces such as propulsion and a variety of on-board "loads" such as shifting cargo, sloshing liquids, and vibrating machinery.

As a floating body, a ship has six degrees of freedom, as illustrated in the drawing below. It can move in any combination of directions—surge, heave, or sway—and can rotate in any of three ways—roll, yaw, and pitch. Any force upsetting the equilibrium will cause a change in speed or position. A vessel's reactions to the sea and wind are termed "motion responses."



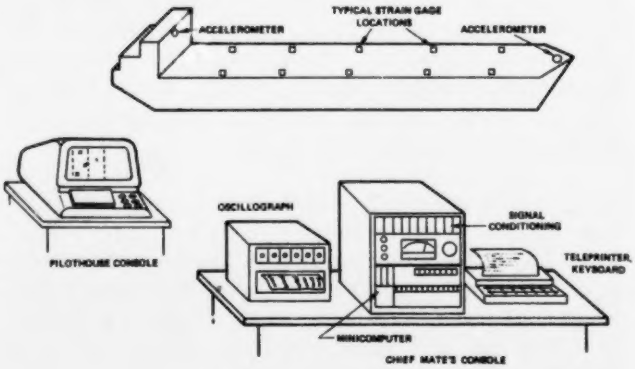
THE SIX DEGREES OF FREEDOM

Instruments which are sensitive and reliable can detect responses the sailor cannot. These instruments can be used to back up the sailor's own observations, creating a semi-closed feedback loop. The sailor knows that his actions will cause a change in conditions. The instruments enable him to measure the relative changes. This data must be available to him as a supplementary piece of information which he can use when he needs it.

A monitoring instrument should be so designed that the sailor can easily relate the information he gets from it to the overall picture. Otherwise, he might be lulled by a false sense of security, believing that the instrument will detect all possible oncoming hazards from the waves; his alertness would then be reduced, and situations not sensed by the instrument could take him by surprise. A properly designed instrument should provide information adjusted to the sailor's ability to interpret and act correctly.

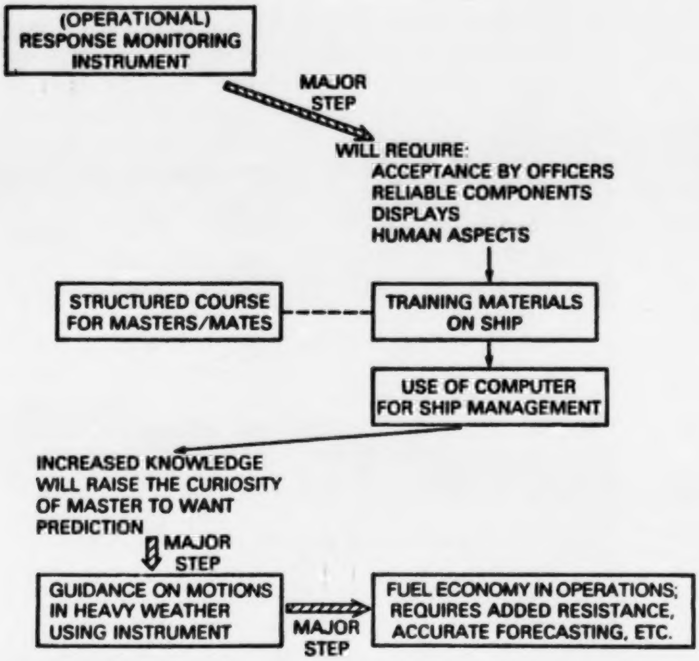
What is a response-monitoring instrument?

Response-monitoring instruments and the computational equipment used to analyze and interpret conditions are simply a tool for prudent seamanship. They provide information for the discretionary guidance of the deck officer,



GREAT LAKES INSTRUMENT LAYOUT

The system pictured above uses strain gauges to measure stress and accelerometers to measure motions. A small computer is used to translate the measurements into information which can be used by ship's officers. This information is displayed on a television-like screen in the pilothouse.


(OPERATIONAL) RESPONSE MONITORING INSTRUMENT
MAJOR STEP
WILL REQUIRE:
ACCEPTANCE BY OFFICERS
RELIABLE COMPONENTS
DISPLAYS
HUMAN ASPECTS
STRUCTURED COURSE FOR MASTERS/MATES
TRAINING MATERIALS ON SHIP
USE OF COMPUTER FOR SHIP MANAGEMENT
INCREASED KNOWLEDGE WILL RAISE THE CURIOSITY OF MASTER TO WANT PREDICTION
MAJOR STEP
GUIDANCE ON MOTIONS IN HEAVY WEATHER USING INSTRUMENT
MAJOR STEP
FUEL ECONOMY IN OPERATIONS; REQUIRES ADDED RESISTANCE, ACCURATE FORECASTING, ETC.

RESPONSE MONITORING

just as the various electronic navigation systems supplement the traditional celestial, pilotage, and dead-reckoning forms of navigation. The systems augment the sailor's own sense for the traditional "feel of the sea" and "working of the ship" even as radar extends the range of his eyes and ears to detect impediments to safe passage. They are alternate means of providing information to the master.

How and where has the development of response-monitoring instruments been pursued?

Research has been underway since the early 1960s in the United States, Norway, England, the Netherlands, and Japan. The recent availability of inexpensive, powerful mini-computers has had a significant impact on recent programs. The authors have evaluated the results of the research projects. This paper will discuss the findings of the Norwegian project and the Maritime Administration's projects on the LASH ITALIA, FURMAN, and BURNS HARBOR in detail and will touch upon the HELM, a U.S. effort that has gained considerable use in North Sea heavy lift operations.

There are various ways to go about monitoring responses. The diagram above shows the authors' approach to response monitoring.

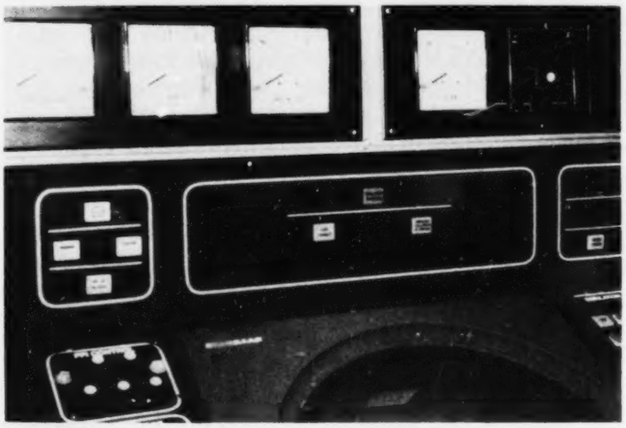
A ship's officer will accept a response-monitoring instrument only if he understands the meaning of the information he receives and knows how he can use it to make decisions. He must also be able to evaluate its reliability. The human must be able to adjust to the "new" way of presenting the "old" information.

Each of the projects to be discussed has shed light on the technical problems associated with the development of response-monitoring instruments and, more importantly, on the need for education and training in the use of these instruments.

The Norwegian project

In 1970, Det norske Veritas, the Norwegian classification society, established a research program on wave loads. From a growing concern over the problems experienced by masters who could no longer fully feel the effects of the sea when navigating supertankers in heavy weather, Det norske Veritas put forward the idea of providing an instrument on the bridge capable of indicating to the master the loads experienced by his ship. It was hoped that a better understanding of the influence of waves on the ship would increase the level of operating safety.

Following the loss of the ANITA and the NORSE VARIANT in heavy weather off Nova Scotia in March 1973, the Norwegian Maritime



The vertical and lateral accelerations, slam, and green-water events are displayed on dial gauges above the Data Bridge radar console. The computer used by the collision-avoidance radar also serves the response-monitoring instrument.

Directorate (the Norwegian counterpart of the U.S. Coast Guard) lent its support to the project.

FINDINGS: the instruments used in the Norwegian project initially featured basic monitoring and simple displays and later incorporated guidance functions. The guidance functions were intended to help mates gauge the effects of course and speed changes. Det norske Veritas found, however, that officers did not understand enough about ship motions and response to use the guidance functions. They also found a rough correlation between age and acceptance of a response-monitoring instrument. This correlation resulted in the navigators' being divided into three classes:

Older	Middle-aged	Young
How he feels about the instrument:		
Get it off the ship	Doesn't have full sense of ship	Supplements senses; wants to know what happens when simulate changes
What kind of instrument he would like to see:		
None	Simple gauge to input feel to his senses	With predictions

In the course of the Norwegian project, it was noted that the master of today has less practical experience in rough weather operations than his predecessor did. This reduces his ability to make "prudent" decisions. This is not a consequence of less education and training but of other factors:

- Improved social conditions have resulted in shorter time periods at sea and more frequent change of ship types, resulting in a reduced feel for each ship.
- Weather forecasts are becoming more reliable and cover larger areas, with the result that ships tend to avoid storms and the crews thus gain less experience from ship operations in heavy weather.

What this means is that the master of the future will have had even less experience with the operation of his ship in rough weather.

Simply buying equipment is not the solution. Proper training and education of ship navigators in the principles of seakeeping and the use of instruments is essential. The training program undertaken in Norway demonstrated that properly trained navigators are more likely to consult and use a monitoring instrument. If an instrument—even the simplest single-gauge monitoring instrument—is to be used, the navigators must be made aware of its potential and its limitations.

This situation led the sponsors of the Norwegian program to develop a structured course in shiphandling for deck officers. They concluded that a basic operational response instrument would be of great assistance to masters who were competent in its use.

Maritime Administration (MarAd) projects

The instruments used in the SS LASH ITALIA, the USNS FURMAN, and the M/V BURNS HARBOR projects were derived from work on hull stresses started by the Ship Structure Committee over 20 years ago.

MarAd support of research on monitoring instruments was based on its interest in improving vessel productivity; the Coast Guard was more interested in the potential for reducing the risks and promoting safety of life at sea. (Although structural failures and vessel losses are rare, when they do occur it is usually with substantial loss of life.) Additional impetus has come from the National Transportation Safety Board (NTSB), which, from its investigation of the TEXACO OKLAHOMA and OCEAN EXPRESS casualties, has recommended that response-monitoring instruments be explored as a means of casualty prevention. The Coast Guard, through the Commercial Vessel Safety Program, has provided technical and funding support for the MarAd projects.

LASH ITALIA

Prudential Lines was concerned about the problems of cargo and hull structural damage resulting from heavy weather operations of its ships. The LASH ITALIA was selected for installation of a modified Heavy Weather Damage Avoidance System. (An earlier commercial installation on a ship carrying perishable fruit from California to Europe was only marginally successful). The LASH ITALIA's instruments included vertical and transverse accelerometers forward and strain gauges located at midships and on the bow side framing.

The LASH ITALIA's computer keyboard sits on top of the equipment box (computer, power supplies, etc.) adjacent to the chartroom. The strain gauges and accelerometers are located at midships and in the bow.

The first phase of the test and evaluation on the LASH ITALIA got under way in the fall of 1975. Operating in scheduled service between ports on the East Coast and the Eastern Mediterranean, the ITALIA had ample opportunity to experience severe sea states in the normal course of service.

FINDINGS: the large amounts of numerical data generated by the computer could not be understood and were not used by the master. On the voyages where a researcher rode the vessel and provided information that the master understood, he accepted the system. The attempts at training the deck officers in the use of the instrument (a computer terminal) were only partially successful—and then only with the younger officers. Computer terminals were not perceived as "friendly" devices by the deck officers, since they could not speak their language. Single command function keys were necessary so that the terminals could speak the mariner's language. Despite all the shortcomings of this first-generation response-monitoring instrument, the deck officers appreciated its potential.

FURMAN

In an effort to address problems similar to those faced by the ITALIA but in a North Pacific environment, the Military Sealift Command agreed to the use of its ship the USNS FURMAN. The project, sponsored by MarAd, the Coast Guard, and the Navy, was conducted from 1977 through 1981.

The FURMAN's devices were set up in much the same manner as the ITALIA's. There were strain gauges for midship bending and bow side framing, accelerometers for vertical and lateral sensing at the bow, and a gyro roll indicator located in the engine room. A cathode ray tube (CRT) display and keyboard were located on the bridge for information presentation.

FINDINGS: the master and mates acknowledged the need for response measurements and display, especially in heavy rolling situations where lashings of explosive cargoes are a serious problem. The initial displays were primarily numerical and were quite unsatisfactory. Ship's officers became involved in developing new displays that fit their traditional concepts. These modified displays (which were achieved merely by changing the computer instructions) were installed near the end of the test program. They allowed the master to display (pictorially) a four-hour trend of the average response and the highest measured response in each 15-minute interval. These modified displays were well received, since the deck officers had provided the key to their acceptance.

BURNS HARBOR

The April 1976 Great Lakes Seaway Port Development Shipper Conference designated the Maritime Administration as lead agency for the development of a stress-warning instrument for Great Lakes vessels. This action was taken in response to the the total loss of two Great Lakes vessels and their crews: the CARL D. BRADLEY in November 1958 and the DANIEL J. MORRELL in November 1966. The MORRELL and the BRADLEY were lost as a result of structural failure in a storm.

The need for a stress-monitoring instrument has increased since the opening of the Poe Lock at Sault Ste. Marie ten years ago. This lock permits the transit of vessels 1,000 feet in length, and the lengths of Great Lakes vessels have increased approximately 30 percent over the past ten years. These long ships are more flexible and thus more susceptible to high-frequency dynamic stress variations at sea.

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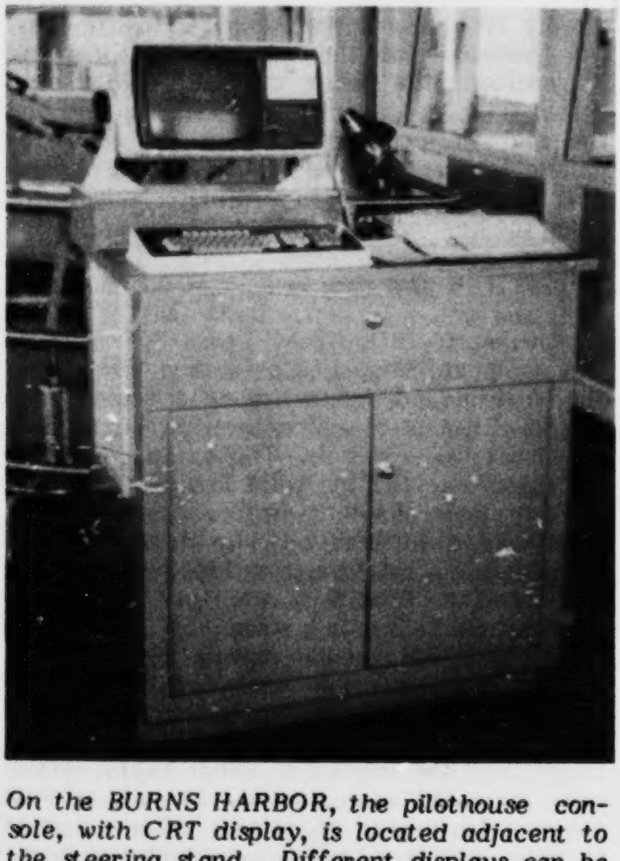
They require better control of hull loads and stresses during in-port operations.

A computer-based instrument was chosen for further study and installed on the Bethlehem ore carrier M/V BURNS HARBOR in 1978. Sets of strain gauges were installed at five locations along the hull girder for sensing hull response resulting from static and low- and high-frequency dynamic loadings. There is a vertical accelerometer at the bow and a lateral accelerometer on the bridge. Information is displayed on CRTs at several locations: in the wheelhouse, in the cargo control room, and in the computer room.

Considerable controversy regarding the use of warning signals was laid to rest when the owner's representative suggested the adoption of selectable alerts. These allow the master to leave instructions for a junior officer to summon him under a prescribed set of conditions. This provides a very active and interesting communication link between the generations: the "old" master can communicate with the "younger" officers. The response levels of the accelerometers and strain gauges become the common reference.



On the BURNS HARBOR, the pilothouse console, with CRT display, is located adjacent to the steering stand. Different displays can be selected at the push of a button.

FINDINGS: many significant findings have come out of the short and yet uncompleted research evaluation program on the BURNS HARBOR. Although the numerical displays were confusing to the master and to the mates, those which contained pictorials of the vessel were readily accepted. The displays associated with the static loading calculator, which the chief mate found useful, were also frequently used. Those displays that referenced wave-induced and springing stress responses were not used, since the crew did not understand the engineering jargon surrounding basic seakeeping or hull girder loadings. The officers expressed the desire to attend a structured training course to help them become familiar with seakeeping. Much hesitation remains because of the many displays to be viewed (these findings are consistent with those of the Norwegian evaluation). Some skepticism was a natural consequence of a few computer failures and minor hardware problems. These, though minor to a researcher who knows how to repair the system, seem "insurmountable" to a potential user. This is an unfortunate reality when an experimental instrument with sophisticated components is placed on a ship. Operational instruments will require a high degree of reliability, but that can be assured through proper design.

HELM

The HELM (Heavy Lifting Monitoring and Prediction) instrument was designed as a commercial venture based on Hoffman Maritime Consultants' participation in the MarAd projects. A change in conditions during heavy lift operations in the North Sea oil fields can have disastrous economic consequences. With such high economic risks, owners decided they could well afford the cost of instrumentation and highly trained operators. Development was swift, and acceptance by the users is high.

Where does a response-monitoring instrument fit into the operations/design of vessels?

The table on the facing page shows the five elements of successful ship operations and design.

The first, second, and third elements are generally the domain of the designer and shipbuilder. The owner, master, and crew are responsible for the latter two elements. Response monitoring, both in port and at sea, falls under adequacy of outfit, whereas training/education in the understanding of responses falls under competence of the crew. Although the table above is slanted toward commercial vessels, naval combatants and Coast Guard cutters face similar operating problems. They all face the same environment—the sea.

The human being is the most important resource and is the key element in the man/machine system. Although each human being is unique, all humans are affected by similar factors when called upon to make safety-related decisions. These include:

- innate personality
- skill and abilities
- the value they attach to their jobs and their abilities
- working conditions
- the goals they wish to achieve and the situations they wish to avoid.

The next step: development of a simple, general-purpose response-monitoring instrument

The authors joined forces with two noted research engineers to present a comprehensive "status report" on these instruments. The forum for the report was the 1980 Spring Meeting/STAR Symposium of the Society of Naval Architects and Marine Engineers. The authors' goal was to close the loop between research and application, since each project had focused on putting technology in place under operating conditions. The paper served to "feed back" to the technical community the reactions and needs of the operators; prominent and respected operators, owners, managers, and researchers commented on the paper. A consensus emerged from the comments: what was needed was a simple system consisting of no more than two or three sensing devices that could be installed on different ships. Since personnel move between companies and ships, the "indicators" placed on containerships and those placed on tankers should have a common element.

> "... technology can readily provide [the mariner] with more information than he can effectively utilize ... A critical factor in future research should be the human engineering of the display so as to promote proper reactions by mariners ... The display of stress and motion data must be unambiguous and provide information of ready practical use to the mariner if it is to avoid leading him into mistakes ... the data selected for display must not divorce the sailor from a concurrent appraisal of the physical sensory indications he has relied on historically."
>
> RADM G. H. Patrick Bursley, referring to the paper from which this article was adapted

The criteria for any instrument to be developed are as follows: 1) the instrument must be

THE FIVE ELEMENTS OF VESSEL DESIGN AND SAFE OPERATION

ADEQUACY OF BASIC DESIGN	ADEQUACY OF OUTFIT	ABILITY TO CARRY SPECIFIC CARGO	COMPETENCE OF CREW	DILIGENT MANAGEMENT
• STRUCTURAL, INCLUDING FIRE PROTECTION	• TOWING, MOOR	• TANK/HOLD DESIGN	• TRAINING: OPERATIONS, NAVIGATION EMERGENCIES	• OWNER AND MASTER SAFETY CONSCIOUS
• HYDRODYNAMIC — POWERING AND MANEUVERING	• NAVIGATION — RADAR, LIGHTS DIRECTION	• VENTING AND PIPING	• LEADERSHIP — COMMUNICATIONS	• PREVENTIVE MAINTENANCE, REPAIR
• HULL INTEGRITY	• OPERATIONAL AIDES	• TANK CLEANING COWS	• LANGUAGE BARRIER — CREW, PILOT	• COOPERATION WITH REG. AND CLASS
• REDUNDANCY — COMPONENTS	• RESPONSE MONITORING — AT SEA AND PORT	• UNDERWAY OPERATIONS	• UNDERSTANDING OF VESSEL RESPONSE	• PROVISION OF HAND-OFF OF INFORMATION TO PILOT
• ARRANGEMENTS — GENERAL AND EMERGENCY	• LIFESAVING AND FIREFIGHTING	• CARGO HANDLING AND EQUIPMENT	• • •	• PORT ENGINEERING
• • •	• • •	• • •		• • •

able to provide the master with meaningful information that is not misleading; 2) it must be free from electronic and mechanical drift; and 3) it must not desensitize the master to his ultimate responsibility for the safe and prudent operation of his vessel. In addressing these problems, the following must be considered:

Human factors - It is important that the master be given enough information to sail his vessel safely and efficiently. His senses must not be occupied with information that is not useful. Consideration must be given to the abilities of each ship's officer when the instrument is implemented. Equipment designers and shipbuilders have to address these human factors issues more today than ever before. The recent explosion in microprocessor technology could easily leave the ship master with ten times as much information as he needs and, even worse, no greater understanding of this additional information. In short, the instrument must be designed for his use, not for exercise of his deciphering skills.

Usability of the display - A display that is cluttered with too many numbers or too much information stands very little chance of being accepted by ship's officers. The displays must be designed to present information in a familiar manner. For example, a simple display of the vertical accelerations at the bow might be represented by a vertical display, or a record of the envelope of bending stress might be a set of horizontal stars which portray the envelope of extremes over the last 15 minutes. A computer/CRT lends itself to changing display formats. The use of single keys to command a display will make the instrument easy to use.

Location of the display - The display should be in the pilothouse and accessible for reference in shiphandling situations. The location of the instrument display in the pilothouse should be directly related to its utilization in a particular aspect of ship operations.

Structured instruction in vessel response and loadings - Training of ship's officers in the operation of the instrument will require more than an explanation of how to start it up or how to shift from one display to another. It will require a structured course on the fundamentals of vessel response to its loadings. This can best be taught in a classroom environment. The course work would be more complex than that done by deck officers in a radar school. Although deck officers at the various schools are currently introduced to the fundamentals of naval architecture, they must also be given a basic understanding of ship motions and loadings. The Norwegian project has considered this a key element of its overall program. Some of the topics covered in the Norwegian course are:

- general ship knowledge, weather facsimiles, and heavy weather damage experience
- statistics, wave/weather interaction, and abnormal wave conditions
- specific examples of motions for different ship types.

The Norwegian course has been taught 15 times. The Coast Guard, to take advantage of the existing course material and teaching experience, invited the Norwegians to teach a demonstration course for masters and mates from selected companies in the U.S. who are operating vessels with response-monitoring instruments. In March 1981, a group of senior deck officers took part in the two-day demonstration course on shiphandling in rough weather held at the United States Merchant Marine Academy. Among the 15 attendees were representatives from a number of major U.S. shipping firms, maritime education institutions, and related government agencies.

Conclusion

The authors have concluded that there is a need for easily understandable response-monitoring information. From the findings of the various research projects, the authors have singled out vertical and lateral accelerations as reliable and meaningful responses. Reliable components and inexpensive (micro)computers to measure the responses are already available. The authors have agreed on a basic design for the "ideal" ship response monitor, or "SRM," and a panel of engineers and ship operators is now preparing specifications (type of sensors, computer, display, etc.) for the SRM.

"A Status Report on the Application of Motion and Stress Monitoring on Merchant Vessels," the paper from which this article was adapted, was authored by Edward A. Chazal, Jr., and H. Paul Cojeen of the U.S. Coast Guard, Kaare Lindemann of Det norske Veritas, and Walter M. Maclean of the Maritime Administration. It was presented at the Spring Meeting/STAR Symposium of the Society of Naval Architects and Marine Engineers held in Coronado, California, June 4 -6, 1980, where it won an award for best paper.

Human Error?

by D. Todd Jones, P.E.
Office of Research and Development
U.S. Coast Guard Headquarters

An airliner is approaching San Diego. In the cockpit, a guest crew member is riding in the observer's seat. The guest, the captain, the first officer, and the flight engineer are engaged in a spirited discussion of retirement benefits. The San Diego controller comes on the radio to give routine landing instructions, adding information about a light aircraft in the area and inquiring whether the pilot can see it. The copilot responds that he thinks he sees it but several seconds later comments that he has lost it. The conversation about retirement benefits continues unabated. The flight recorder captures the pilot's exclamations as a midair collision occurs.

"I HAVE MIXED FEELINGS ABOUT OUR NEW SKIPPER—HALF FEAR, HALF PANIC!"

It is 0005 hours on January 31, 1975, and a U.S.-flag commercial tanker is outbound from the Monsanto dock at Marcus Hook, Pennsylvania. A Liberian-registered tanker is still unloading at the British Petroleum dock on the other side of the channel.

The weather is clear and cold, visibility is eight miles, and the tide is flooding at 1.6 knots. The pilot of the American tanker is on the port bridge wing, the master is on the starboard bridge wing, and the mate remains in the wheelhouse.

The pilot assumes the conn and orders the rudder hard left, bow thruster on full right, the engines dead slow ahead, and the lines cast off. As they clear the dock in a slow turn to the right, the pilot orders the rudder to right full. As they turn toward buoy D, the pilot uses his portable radio to contact a second U.S.-flag tanker, upbound on the river.

As the first tanker approaches buoy D (about 0010 hours), the pilot releases *the assisting tug and orders the engine half ahead. Shortly thereafter, the master expresses his concern to the pilot about whether they can make the turn without danger to the Liberian-registered tanker. The pilot assures the master that the turn can be made and that there is room in the channel. The pilot resumes his conversation with the second American tanker from the port bridge wing.*

About five minutes later, the master again expresses concern about the maneuvering and recommends putting the engines astern. He receives no reply, as the pilot is still talking on the radio.

Minutes later the bow lookout reports that they are too close to the Liberian-registered tanker, leaves his position, and runs aft. The master orders the engines full astern. The pilot, hearing the order, recommends a "double jingle" (emergency action) engine order and the dropping of the anchors. The master concurs, rings the engine order, and orders the anchor dropped, but the bow lookout has already left his post. The master then sounds the general alarm. Moments later, the two tankers collide.

It is 4 a.m. on March 28, 1979. In the control room at the Three Mile Island nuclear power plant, operators are working as usual. They do not notice that a cardboard maintenance tag attached to the control panel is covering the light that indicates the feedwater valve is closed.

When the system shuts down (in the well-known incident), the operators watch for the emergency cooling system to go into effect. Unbeknownst to them, the entrance of the cooling water is blocked by the closed feedwater valve. Compounding the problem is the fact that a relief valve has stuck open, allowing what cooling water is in the system to be driven out by the heat and pressure. The operators assume that the system has resealed and that auxiliary cooling water is entering. They become concerned primarily about what they think is the unusually high water level and how to shut off the "excess" water that may cause damage.

As is now history, they made an incorrect diagnosis. For approximately two hours they did not recognize that rather than too much cooling water, they had too little. Indeed, the particular combinations of temperature and pressure in the reactor meant it was boiling dry and the fuel rods were being damaged. Such a condition can lead to lack of control of a reactor and result in serious damage to the reactor itself and the release of radiation.

Three tragic accidents, each attributed to "human error." The context and specific details varied from situation to situation, yet there were certain similarities. In each case, the operator was performing a "routine" task; he continued performing that task in conditions that turned out to be unusual. In each case, the operator failed to act on new, vital, and pertinent information calling for a response that deviated from the familiar. In none of the three cases did a single, unique causative human error occur; problems developed over time.

Human error

"I was in a hotel restaurant when the check came. I signed my name to it but couldn't remember the number of my hotel room. So I looked at my watch."

A woman got into her automobile, started the engine, and then noticed that the windshield was dirty. She turned on the wipers and squirted water on the windshield. When the windows were clean, she intended to turn off the wipers. She turned off the ignition instead.

Human errors abound in today's technical society, but most of them are subtle and inconsequential; they pass unnoticed and do not result in accidents. Research, however, indicates that human error accounts for between 60 and 80 percent of all accidents. Yet allowance for human error has decreased greatly with the introduction of large, fast, and highly sophisticated ships, and the consequences of human error have become greater.

What exactly is meant by "human error"?

The term "human error" as used in discussions of marine safety often connotes some shortcoming or failure. When an accident occurs, for example, ship operators are typically said to have "not recognized some environmental disturbance" such as current or "not properly aligned the vessel within the channel." Another typical example is the operator who "failed to sound the proper whistle signal" in violation of the Rules of the Road. The implication is that the operator ought not to have made such a mistake and that the undesired event would not have occurred if he had not. Although this position might be defensible in some cases, it oversimplifies the problem.

First, it assumes that an accident is the result of a single factor. Second, it assumes that a) the "environmental disturbance" (or any other information bit) can be perceived with precision (in time for action), b) to perceive it is to know what to do about it, and c) the disturbance can in fact be compensated for by both the human operator and his vehicle. A third assumption is also implied. The human error explanation of accidents generally gives the impression that the system is otherwise perfect: information is readily available, its implications are clear, the vessel can respond, the operating area is suitably designed, and the Rules of Road, if followed, ensure safety.

. . . we must see human errors as indicators of underlying problems.

Given the foregoing notion of error and the assumptions it implies, it is easy to understand why the majority of accidents are said to result from human error. With this definition of human error, anything short of outright mechanical failure within the system or an act of God is a human error. In fact, one could argue that even outright mechanical failures are human error—in design or maintenance.

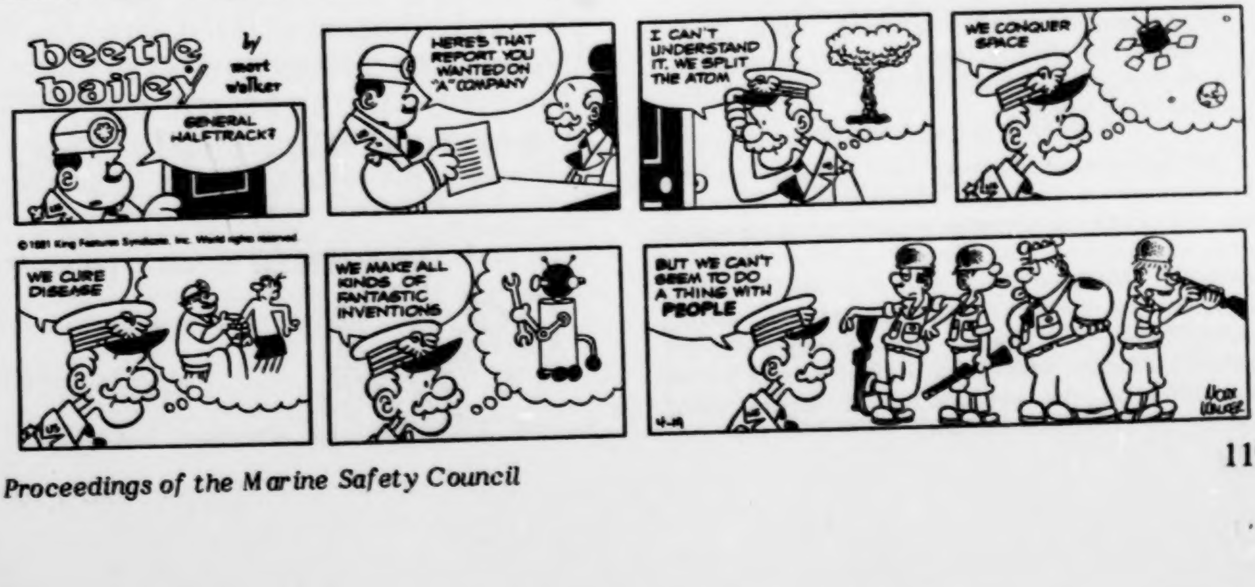
Human error is perhaps more realistically and productively defined as some human action or inaction, regardless of fault, which ultimately results in an undesired event. Such error can be subdivided into two basic categories: "human-caused errors" and "situation-caused errors." To make a distinction, "human-caused error" refers to what the operator did, did not do, or could not do, regardless of fault or blame, while "situation-caused error" refers to the factors that contributed to the operator's behavior. The latter term takes in both human attributes and other system attributes.

Human-caused errors may be further subdivided into two categories: competency errors and incompetency errors. Incompetency errors are those made by incompetent or incapacitated personnel. People may be inattentive, careless, reckless, poorly informed, or incapacitated, temporarily or characteristically. These errors generally represent a small percentage of the human-caused errors and are difficult to reduce except by proper personnel selection and qualification and frequent medical check-ups.

Two sales clerks in a catalog order department were both on the phone at the same counter, each talking with customers and filling out forms for charge-card purchases. One had to pass behind the other in order to get a form, and so the clerks changed positions. When the first clerk finished her phone call, she hung up the phone. She hung it up on the wrong instrument, thereby cutting off her coworker's conversation.

In getting ready for a party, one person carefully prepared a cake and a salad, then put the cake in the refrigerator and the salad in the oven.

Competency errors, on the other hand, are made by operators who are considered reasonably able, who perform their work successfully day after day, and who are not apparently incapacitated at the time of an accident. Within this category, the errors made by the operator can often be attributed to any number of factors; rarely, if ever, is a competency error the result of a single factor. Competency


beetle bailey
by mort walker
GENERAL HALFTRACK?
HERE'S THAT REPORT YOU WANTED ON "A" COMPANY
I CAN'T UNDERSTAND IT. WE SPLIT THE ATOM
WE CONQUER SPACE
©1981 King Features Syndicate, Inc. World rights reserved
WE CURE DISEASE
WE MAKE ALL KINDS OF FANTASTIC INVENTIONS
BUT WE CAN'T SEEM TO DO A THING WITH PEOPLE
4-19
MORT WALKER

errors can be divided into groups. Errors in the first group are related to man's ability to make a decision. Errors in the second are related to man's ability to carry out the decision. Situation and response are interactive, altering each other and both contributing to the negative outcome.

Man's ability to make correct decisions at any given time can be affected by a number of factors (we are assuming that all the information necessary to make a satisfactory decision is available). These include intelligence, motivation, perception, stress, fatigue, confidence, and training and experience.

Says a ship's captain:

> *"I get more calls (to the bridge) between 10:00 p.m. and 5:00 a.m. This is because, with the contract, inexperienced watch officers are on duty when no one else is around."*

The greater the training and experience a person has had, the better qualified he will be, in most cases, to make a correct decision. By the same token, he is less likely to make a mistake than a less qualified man with less training. Performance under stress varies from person to person. Some will remain calm and not regard the situation as stressful or critical; others may become excited and nervous. Experience and training can have a great bearing on personal performance under stress.

There are other short-term factors that affect performance as well. The most common of these is fatigue. All too common are situations where officers, especially masters, pilots, and first mates, are called upon to make decisions after long hours of duty.

> *"The 12-4 (watchstander) is perpetually tired, and he misses a meal. My 12-4 brought the ship in, stands a watch until 5 a.m. tonight, and will take the ship out at midnight tonight."*

Situation-caused errors are related to the environment a person is working in. Some of the elements which make up a person's work environment are his thermal environment, his visual environment, his acoustic environment, and his chemical environment (sight, sound, taste, smell, and heat). These factors can all have significant effects on human performance and thus on the probability of errors being made. Such factors include:

a) lighting levels on the bridge, work surface lights, instrumentation light levels;

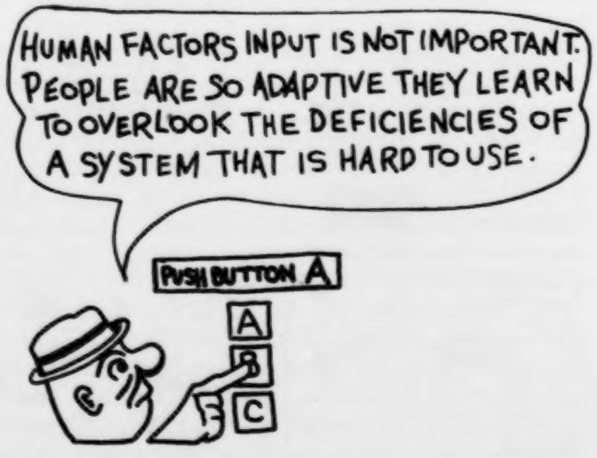
b) ambient and transient noise levels, including intensity, duration, and location;

c) heating and ventilation levels; and

d) pollutants and toxicants in the air.

> *A malfunctioning feed pump was being repaired on a "Falcon" Class Tanker. This caused a red light to appear in a spot on the bulkhead of the bridge in a panel array. The engineers told the mate on watch not to concern himself with the light, that it was under repair, etc. In the early morning hours when the Second Mate was "shooting stars," another red light went on. It was located directly below the other light, next to a window with early morning light as a background. Busy with his navigational duties, the Mate did not observe it. The light turned out to be an oil light, indicating that valves in the engine had burned out. The resulting damage sent the vessel into dry dock for extensive repairs.*

A second group of factors deals with the design of the work space. Consideration should be given to the operator's position, posture, and reach in the design of the work space. Although these factors may affect performance (and hence errors) only indirectly, their importance should not be overlooked or underestimated. Indeed, these factors are attaining increasing importance with the development of bridge design aimed at one-man control of the vessel from the bridge. Here the navigation


HUMAN FACTORS INPUT IS NOT IMPORTANT. PEOPLE ARE SO ADAPTIVE THEY LEARN TO OVERLOOK THE DEFICIENCIES OF A SYSTEM THAT IS HARD TO USE.
PUSH BUTTON A
A
B
C

and control instruments are brought together into a console at which the man is seated and from which he can control the vessel.

A third group consists of factors associated with machine design. Chances of an accident are increased, for example, if machines do not operate in predictable ways:

> *A major international automobile manufacturer designed the windshield wiper controls on the right side of the steering wheel and the light controls on the left. Several years later on a newer version of the same car, the controls were reversed.*
>
> *The U.S. Air Force had problems with the newly accepted F-111B, a sweep-wing, two-seat, jet aircraft. Pilots with plenty of flight time and experience in the aircraft were crashing. Examination showed that the original design for the control of the wings called for the wing control rod to be pulled back to sweep the wings in for faster flight. Pilots, in emergency situations or under stress, would pull back on the throttle and the wing controller, causing the aircraft to lose power and lift.*
>
> *A new major Army radar system would not operate for the Army testing crew. The contractor was called out to inspect the system and make repairs. The system designer, when he arrived, could find no errors. Closer examination of the system and observation of the designer performing tasks on the radar showed that the designer was left-handed.*

During an emergency there is little time to identify controls by the labels. Operators claim that they learn "patterns" of control locations and lights and pay no attention to labels. This is fine for more frequent and familiar situations. It is the less frequent ones that are of concern.

Errors, then, result from the poor design of machines as well as from the inadequate skills of the human operators. They may also result from what goes on inside the operator's head. The latter cause of error we know little about and can do nothing about right now, but the other kinds of error are within our control.

Control of error

Individual research efforts in the United States, Norway, the Netherlands, Germany, and Great Britain have reaffirmed that, as the Maritime Transportation and Research Board puts it,

> ". . . accidents usually develop through relatively long sequences or chains of events, the interruption of which anywhere along the path (before a certain point) will normally preclude accident occurrence."

In marine accident investigations it is important to recognize the limits of the investigative reports insofar as human factors are concerned. Investigations of vessel accidents currently focus on finding a "cause" (normally a violation of the law, a regulation, or established procedures) rather than reconstructing the accident. This unfortunately fosters the view that the "system" is near perfect and whatever bad results have occurred have been the result of some human fault.

If we continue to perceive human errors this way, we will continue to see them as the causal event in most accidents. If anything is to be done about accidents beyond talk and litigation, however, we must see human errors as indicators of underlying problems. We must get away from the tendency to pronounce an operator at fault and close the case.

As previously stated, most accidents result from a series of events. The more complex the system, the more accident-enabling factors or error opportunities there are. Conversely, each of the many causal factors in the accident equation offers the opportunity for correction—elimination of any one of those factors will usually interrupt the sequence of events and prevent the accident from occurring. Given the difficulty of pinpointing the factors in human-caused errors (i.e., motivation, perception, vigilance, etc.) and the lack of data on such errors, it is more likely that improvements in system safety will come from control of situation-caused errors.

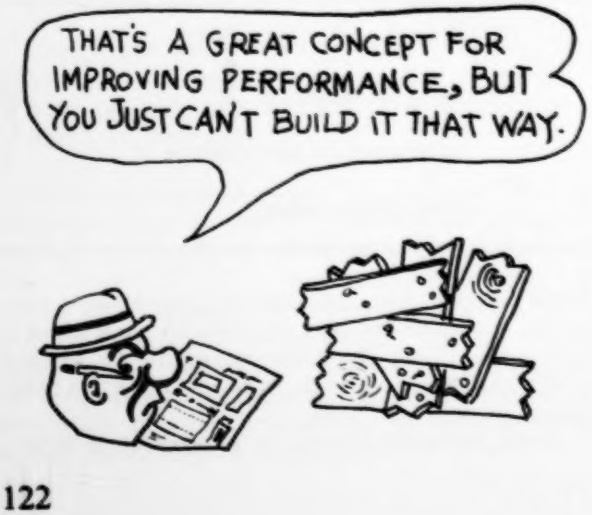
Chances of an accident are increased . . . if machines do not operate in predictable ways.

Care, however, must be exercised in introducing system improvements. Casually assuming that "one more piece of equipment" or "additional training" will solve the problem is not sufficient or realistic. Proper preliminary research and an understanding of the actual problem (not necessarily the perceived problem) are prerequisites to acceptance of any solution.

Such caution will prevent a repeat of the phenomenon that occurred in the mid-1950s. At that time it was felt that additional "sensors" were required to assist bridge watch standers in determining the presence of other vessels. This belief was accepted uncritically, and radar sets were extensively installed on vessels. Over the subsequent years, it was noted that vessels with radar were involved in collisions about as frequently as vessels without radar. In certain conditions (notably fog) the availability of radar fostered a false sense of security, thus contributing to what has been termed "radar-assisted collisions."

How, then, to best reduce, remove, or eliminate sources of human error? Several methods exist, but none of them can be implemented alone, for each attacks only one aspect of the human error problem.

If mariners are making errors because they have difficulty operating the equipment, the solution is proper equipment and work environment layout. There currently exists a strong need for standardization of equipment and bridge layouts. Basic equipment design and data inputs to the watch keepers should be defined and then standardized. The obvious place to start any effort at standardization is the ship's bridge. There are lots of things that are "bad" about current bridge designs—windows that you cannot see through because they are in the wrong direction, panes of glass that give dazzling reflections, inconsistent labeling of instruments (some have white letters on black, some have black letters on white), indicator lights that are far too bright and blind you—this sort of thing is repeated time and time again in ships.


THAT'S A GREAT CONCEPT FOR IMPROVING PERFORMANCE, BUT YOU JUST CAN'T BUILD IT THAT WAY.

There is a great deal that can be done to prevent human error by improving the design of a ship's bridge. There is also plenty of room for improvement in machinery control spaces, the radio office, and so on, but, because of its importance, the bridge is the place to start.

There are currently two major draft bridge design "codes of practice" available, one issued by the British government and the other issued by the government of the Netherlands. Anthropometric considerations (i.e., how high, how far, where to place for easy control, etc.) are the underlying principle for bridge design in these proposed standards. This is a start, but additional work must be done before complete bridge design standards or recommendations are accepted internationally.

What about other kinds of mistakes? Consider training. A lot can be done in the way of building and operating ship training simulators. Quite a few of these are appearing around the world. The Dutch were the first in the field. The Dutch have had simulators at Delft and Wageningen for some years now. Other simulators are currently operating in Great Britain, Germany, Japan, the United States, Sweden, and Norway and are planned or under construction in Finland and the Soviet Union. The simulator provides a ship's bridge complete with all its instruments. A computer is programmed to simulate such conditions as the deterioration of steering in shallow water and the effects of wind and current. Such a machine can be used for training not only one man at a time but a bridge team; it can take the crew through all crisis situations and mishaps, groundings, failure of steering gear, and so on, and drill the crew repeatedly until crewmembers automatically respond correctly.

Although simulators are used for training, they are not always used well. One simulator examined did a good job of simulating sea conditions and required tasks. What it did not do was record the complete transaction between man and machine. Such a complete record is essential if a simulator is to be used not only as a simulator but also as a selector, a trainer, and an assessor and maintainer of skills.

What seems to be lacking is an overall plan that puts all the parts together in a systematic way and assures that human operators are kept at a desired level of efficiency. To do that, companies must not only upgrade selection and training procedures but also must figure out ways to constantly monitor and maintain the skills of their key operators. By periodic retraining of personnel in simulators, companies can prevent lapses in performance and reduce errors.

The simulator can also be used to reconstruct accidents and to determine the probable causes in accidents. No doubt there are more uses. Simulator development is well underway and will yield increasing benefits as the years go by.

Where do we go from here?

The increasing complexity of ship and shore-based systems, the tremendous increase in ship dimensions, the growing professionalism of the people who operate ships, the need for economy, and the changing attitude toward pollution and safety require a ship transportation system that is designed to operate safely, efficiently, and harmoniously.

As a consequence of these requirements, shipbuilders, waterway and harbor builders, designers of navigational aids and other subsystems, as well as lawmakers and regulatory authorities have to take into account that people can perform adequately only if their tasks are suited to the capabilities, limitations, attitudes, and needs inherent in human nature.

It is easier to promote technical development than to cope with difficulties regarding ship operation, crew training, and international relations. Hence, the human component is too frequently relegated to the background, when it is not simply forgotten altogether. While it is true that much progress has been made in ship design, equipment, navigational aids, etc., serious gaps of a technical nature still exist. These make it even more difficult to resolve the problem of human errors. It is absolutely essential that human factors be given more importance.

. . . people can perform adequately only if their tasks are suited to the capabilities, limitations, attitudes, and needs inherent in human nature.

> *"Anybody can design a machine that man can use, for, after all, isn't the designer a man, too?"*

Look closely at the control room of any "continuous" process, such as one finds at refineries or chemical manufacturing plants, and you will see a large number of dials and controls, warning lights, pressure gauges, and indicators with electrical readings in watts, amperages, and volts. What is happening is virtually automated. Indeed, if plant designers had their way, the human operators would be present merely as window dressing: to satisfy government regulations and to reassure the public that if the machines fail (but, of course, the designer doesn't really think they will) someone will be there to cope.

There is an increasing tendency to "design the man out" of the system . . .

Although there are many small failures and a few large ones in these systems, they are, overall, remarkably reliable. This reliability is the basis of a paradox: the human operator has virtually no actual experience doing the thing he is put there to do. Therefore, the more reliable the machine, the less reliable the human operator.

Most complex systems involving men, machines, and computers are designed as if the human components are afterthoughts. Yet, all too frequently, human factors engineers and psychologists are called in because the operator cannot work the equipment or because accidents occur. This is a pattern that will continue. Since less than 5 percent of the world's funds for research and development, test and evaluation, or design and construction go to solve "human problems," although "human error" accounts for between 60 and 80 percent of all accidents, accidents, too, will continue to occur. There is an increasing tendency to attempt to "design the man out" of the system, yet in most cases man is still required to monitor the system, "be there if anything happens," or make decisions based on what the equipment tells him.

The Mariner is a Human Resource

by LCDR Robert W. Henry
Ship Design Branch
Merchant Marine Technical Division

The managerial personnel practices routinely associated with a modern business enterprise have evolved over many years. Today they form the basis of a sophisticated science known as human resource management. Application of these principles by the maritime community has been slow because of the generally conservative nature of the industry. With the increased focus on accidents resulting from "human error," there has been a growth in research applying human engineering principles to the mariner in the hope that this will reduce the vessel casualty rate. The objective of this article is to comment on these trends, both internationally and nationally, and to speculate on their effects on the Coast Guard's Commercial Vessel Safety Program.

International

The currents that gathered force during the 1970s to shape the design and operation of commercial vessels can only intensify during the 1980s, forcing the marine industry to extend its adaptation of human engineering. Several factors have influenced and will continue to influence the international maritime community's efforts to reduce the number of accidents attributable to human error. There will be intense international competition to attract and hold qualified and dedicated seafarers, a scarce resource, especially in Europe. The complexity of shipboard systems will steadily expand, requiring an accompanying increase in the education and technical sophistication necessary on the part of the marine professional.

The Inter-Governmental Maritime Consultative Organization (IMCO) sponsored the 1978 Conference on Training, Certification and Watch Keeping of Seafarers. Although it will be years before its impact is felt, the conference has already resulted in a stronger focus on the competence of the mariner. IMCO has also recognized the significance and scope of the human error problem and has resolved to become the international forum for discussion of the subject. IMCO is presently addressing the topics of bridge design and layout, vessel maneuvering standards, and trim and stability instructions to the master.

The international community has also recognized that the application of human engineering principles to vessel design and operation can yield valuable rewards. The following trends already established during the 1970s will grow during the 1980s. A managerial approach to the functions of vessel navigation will bring about increased use of methods such as bridge team training on marine simulators. In fact, there will be an increased use of sophisticated simulators by all marine disciplines. Rapid advances in technology will make simulators available to many users.

Time at sea is traditionally thought of as "99 percent boredom, 1 percent stark terror." The simulator will enable trainees to concentrate on that 1 percent stark terror.

Participatory management by the crew will grow and will erode the traditional distinction between officers and rated crewmembers. Increased emphasis on shipboard equality and greater crew motivation and stability will lead to a reduction in the high crew turnover rate. In addition, there will be greater use of cooperative superstructure design workshops during the conceptual stages of a vessel's design.

National

Because of the small size of the U.S.-flag fleet and the generous wages paid to U.S. mariners, the problems associated with European crews do not exist to the same extent in this country. However, improving the quality of the American seaman and the manning standards of foreign vessels operating in U.S. waters is a task that will receive emphasis during the 1980s.

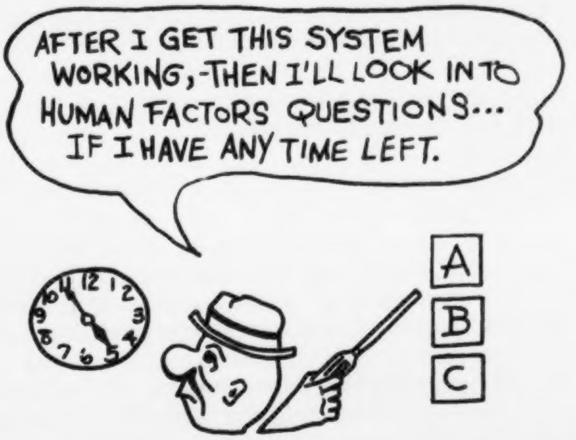
As in the rest of the world, the marine simulator will play an increasing role. Better understanding of its uses and benefits and increased accessibility will entice groups that have traditionally resisted this type of technology to use it. Increased industry acceptance and use of marine simulators will aid in teaching good shipboard standard operating practices. Time at sea is traditionally thought of as "99 percent boredom, 1 percent stark terror." The simulator will enable trainees to concentrate on that 1 percent stark terror (dangerous situations, casualties, and adverse weather). Here is where the bridge teamwork concept can be forged. Greater reliance by vessel operators on "passage planning" and its effective implementation and tighter control of the watch-changing routine will also be emphasized as a means of reducing problems associated with human error.

Technology will make available devices that will allow a ship's operator to better assess stress and motion influences that would otherwise be masked by the sheer size of his vessel. Increased use of new motion- and stress-sensing technology will aid the bridge watch keeper to "feel" bow flare and bottom slamming on large vessels.

Anticipated reductions in Maritime Administration vessel operating subsidies and renewed pressure on maritime unions to further reduce crew size will significantly influence vessel design from the bridge to the machinery space. The U.S. maritime community will be under pressure to compete in a world market that is generally years ahead of it in the adaptation of progressive management to human resources and productivity. Improvements in shore-based and shipboard management of personnel and the relationship between the shore-staff and the ship will be necessary. This is best described as management of human resources and will extend to the following areas:

1. Defining and satisfying the social needs of the mariner while realizing that shipboard problems such as boredom cannot always be solved by means such as higher habitability standards.

2. Developing methods to reduce excessive reliance and task loading (pressure)


AFTER I GET THIS SYSTEM WORKING,-THEN I'LL LOOK INTO HUMAN FACTORS QUESTIONS... IF I HAVE ANY TIME LEFT.
A
B
C

on certain shipboard individuals such as the master or officer of the watch.

3. Improving bridge designs with greater attention to lighting, temperature and humidity specifications, and placement of equipment.

4. Fostering more effective approaches to shipboard safety and accident prevention. Vessel safety should be recognized as a problem requiring the initiative of all levels of management, not just the individuals on the vessel.

Commercial Vessel Safety

The Coast Guard, like most Federal agencies, will be under increased pressure to reduce its regulatory impact on the public. Although the Commercial Vessel Safety Program is being restructured, vessel safety itself will not be sacrificed. Further work on bridge visibility and bridge design and layout, including an assessment of information flow on the bridge (amount, type, format, and suitability), will be continued. The Coast Guard can review non-safety-related habitability regulations that impede innovations in the design of the superstructure. This effort may be integrated into an overall project to streamline Coast Guard vessel safety regulations.

The Coast Guard will continue to take those steps necessary to reduce the rate of serious marine casualties. The following steps could help in achieving this objective:

1. Investigating the possibility of:
    a. equipping vessels with devices similar to the flight data and voice recorders now on commercial aircraft
    b. the voluntary reporting of "near-miss" accidents.

These would aid in vessel casualty analysis.

2. Developing a standard format for the use of the Coast Guard maneuvering simulator as a casualty-analysis tool.

3. Evaluating the means of ensuring swift and accurate investigation of major casualties by knowledgeable individuals.

4. Assessing "competency errors" in mariners. It has been noted that the absence of anxiety or anticipation before a casualty is indicative of the need to instill "defensive awareness" in mariners and to reduce their high level of acceptance of calculated risk.

In response to international conventions and new U.S. laws, the Coast Guard is planning to evaluate various changes in personnel licensing procedures. License qualifications, periodic performance testing of license holders, and the use of simulators as a partial substitute for at-sea experience for license applicants are topics that will receive careful consideration. Work is presently under way to validate marine simulator training effectiveness and skill retention. This project could be extended to evaluate standards necessary in the accreditation of marine simulators for training and licensing.

The maritime community, in the hope of improving the marine casualty record, is paying increased attention to the subjects of human engineering, human error, and management of human resources. There has been some skepticism shown toward this approach by those who feel that the best way to improve the casualty record is the traditional one—adding more sophisticated equipment to the bridge. In rebuttal to this philosophy, we can reflect on the words of Dr. John S. Gardenier, an operations research analyst with the Coast Guard's Office of Research and Development: "No major progress can be made as long as we look for the solution where the 'light' is clearest, rather than where the problem lies." Sooner or later the real issues behind "human error" will have to be addressed by the marine community. ⚓

> **. . . the absence of anxiety or anticipation before a casualty is indicative of the need to instill "defensive awareness" in mariners and to reduce their high level of acceptance of calculated risk.**

Chemical of the Month

Acetaldehyde:

CH_3CHO

synonyms:	acetic aldehyde ethanal ethyl aldehyde
Physical Properties	
boiling point:	21°C (70°F)
freezing point:	-124°C (-191°F)
vapor pressure at	
20°C (68°F):*	750 mm Hg
21°C (70°F):	760 mm Hg (1 atm.)
Threshold Limit Values	
time weighted average (TWA):	100 ppm
short term exposure limit (STEL):	150 ppm
Flammability Limits in Air	
lower flammability limit:	4%
upper flammability limit:	60%
Combustion Properties	
flash point (c.c.):	-39°C (-38°F)
autoignition temperature:	175°C (347°F)
Densities	
liquid (water = 1.0):	0.8
vapor (air = 1.0):	1.5
Identifiers	
U.N. Number:	1089
CHRIS Code:	AAD

* considered "room temperature"

The chemical acetaldehyde (pronounced as-it-AL-duh-hide) is found as a natural product in many fruits; it is an intermediate product in the respiration of many plants. One of its more interesting uses, in fact, is as an indicator of "ripeness": the amount of acetaldehyde present in fruit held in cold storage is a sign of how ripe the fruit is.

The first artificially produced acetaldehyde was made by the Swedish chemist Karl Wilhelm Scheele in 1774. In 1835, Baron von Liebig, a German chemist, defined its chemical structure and gave it the name "aldehyde," a combination of the translation from Latin meaning alcohol dehydrogenated (alcohol from which some of the hydrogen atoms have been removed). The name "aldehyde" is now used for a class of chemicals, of which formaldehyde (HCHO) is the simplest member, followed by acetaldehyde (CH_3CHO).

Earlier in this century, the primary method of producing acetaldehyde was a process that used ethyl alcohol as the main starting material. During the early 1960s, this gave way to a method employing oxidation of the chemical ethylene. A third method of producing acetaldehyde, hydration of acetylene, has also been largely replaced by the safer ethylene oxidation method; what little use of the acetylene method still exists is found mostly overseas.

Acetaldehyde was first used commercially during World War I as an intermediate in the production of the chemical acetone. Today it is used in the manufacture of such chemicals as acetic acid (which in 1976 accounted for 60 percent of its use), acetic anhydride, cellulose acetate, and vinyl acetate resins, to name a few. These, in turn, are used to make paints, plastics, dyes, fuels, and synthetic rubbers, among other things.

Acetaldehyde, which boils at room temperature, presents health hazards in both its liquid and vapor states. Its vapors can cause irritation of the eyes, nose, and throat, and high concentrations will cause dizziness or drowsiness and could eventually lead to unconsciousness. The liquid, if splashed in the eyes, could cause irritation and burning. Ingestion (swallowing acetaldehyde) causes drowsiness, unconsciousness, kidney damage, and breathing difficulties. Repeated or prolonged exposure can cause an allergic skin rash.

Persons working around acetaldehyde should wear protective goggles or a face shield, gloves, impervious clothing, and boots. If clothing becomes wet with the liquid, it should be removed and cleaned before being used again. Anyone entering a tank or enclosed space containing acetaldehyde vapors should be sure to wear proper respiratory protection such as a self-contained breathing apparatus.

In cases of exposure to the liquid, affected skin areas should be washed with plenty of soap and water. The eyes, if involved, should be thoroughly flushed with water. If acetaldehyde is ingested, the victim should be given large quantities of water to dilute the substance; vomiting should then be induced. Victims overcome by breathing acetaldehyde vapors should be removed to fresh air and, if breathing has stopped, given artificial respiration. In all cases of exposure, medical help should be sought immediately.

Acetaldehyde vapors will form flammable or explosive mixtures with air over a wide range of concentrations. If not protected by a blanket of inert gas such as nitrogen, liquid acetaldehyde will react with oxygen in the air and may form shock-sensitive peroxides. Acetaldehyde is easily oxidized and polymerizes readily; these reactions can be violent if even traces of initiators (substances which can set off reactions), such as sulfuric acid, are present.

Refrigeration is one method of liquefying acetaldehyde for shipping and storage. The more usual method is to maintain the acetaldehyde in a pressure vessel without refrigeration. The tanks, valves, piping, and hoses used in transport and storage of the chemical should be made of steel, stainless steel, and aluminum. Copper and alloys with copper can form explosive copper compounds if exposed to acetaldehyde and should not be used in systems that come in contact with the chemical. Since acetaldehyde vapors can form flammable mixtures with air, all of the metal components of its shipping and storage system must be properly electrically grounded. If this is not done, static electricity may generate sparks, which would serve as a source of ignition for these flammable vapor mixtures.

The Coast Guard has designated acetaldehyde in its liquefied gas form a Cargo of Particular Hazard (COPH) and a Certain Dangerous Cargo (CDC). Regulations for its carriage are found in Subchapter O of the Code of Federal Regulations. Internationally, acetaldehyde is covered by the Inter-Governmental Maritime Consultative Organization (IMCO) Gas Code for gas tankships. Both IMCO and the U.S. Environmental Protection Agency consider acetaldehyde a Category C Pollutant.

Hazard Evaluation Branch
Cargo and Hazardous Materials Division

Lessons from Casualties

In September 1980, an Offshore Service Platform, commonly called a lift boat, capsized and foundered in heavy weather while in its jacked-up mode adjacent to an unmanned satellite platform. This casualty was the result of a number of circumstances including bad weather, possible mechanical failure, and possible poor vessel design. By discussing them here, we hope to alert other operators to the problem and possibly prevent similar occurrences on other rigs.

The vessel was self-propelled and had a barge-like hull 62 feet long and 24 feet wide with three cylindrical legs positioned one amidships on the stern, one on the port bow, and the third on the starboard bow. Each leg had been modified from an original length of 60 feet to a length of approximately 90 feet, and each had a pod at its base that measured 8 by 12 feet. The barge was raised or lowered on the legs by hydraulic motors with power supplied by the vessel's main propulsion motors. Jacking was accomplished by gears that engaged a toothed rack running the length of the legs. The legs traveled in lubricated funnels permanently welded to the vessel.

The vessel had not been constructed to any classification standards, nor was it required to be inspected by the Coast Guard. The owners were not provided with any operating limitations such as maximum water depth by the builder. The owner's insurance company had, however, imposed a 40-foot operating depth limit on the vessel prior to the modification of the legs. According to the captain, that limit had been increased, but he didn't know by how much. Further insurance company restrictions required that the vessel not be jacked up or down in seas exceeding five feet.

The vessel was jointly owned by two men who also alternated as captain of the vessel. Both men had approximately 2½ years' experience operating lift boats of the type involved in the casualty. The only additional member of the boat crew was a deckhand.

At the time of the casualty, the vessel was leased to an oil company. It was being used by a crew which the oil company had contracted to sandblast and paint various platforms. No contract existed between the boat owners and the painters and sandblasters. The oil company specified which platforms needed to be serviced, then either a company representative or the foreman for the sandblasting and painting company directed the vessel's movement. The vessel's captain was consulted on matters of mutual concern, but the contract responsibilities of the two were distinct.

The sandblasting and painting crew consisted of eight men, including a cook, with varying degrees of experience offshore. One member of the contract crew was spending his first hitch offshore with the company. Apparently none of the men was familiar with the American Petroleum Institute (API) RP-T-1, Recommended Practice Orientation Program for Personnel Going Offshore for the First Time. No emergency drills were conducted, and the cook learned where the life jackets were stored only because he chanced to open the locker in the galley containing them.

While the vessel was in its jacked-up mode and operations were being conducted on an unmanned satellite platform in 54 feet of water, the weather deteriorated because of a tropical depression. Operations were halted because of the weather, and the crew spent the day in the mess room watching TV, playing cards, and talking.

There is some doubt about the amount of air gap between the bottom of the hull and the surface of the water. The captain stated he had between 10 and 12 feet, but no accurate measurement of the distance was made. At the time of the casualty the seas were running in excess of 6 feet. Calculations made after the casualty placed the height of the hull above the water as "most probably" approximately 6.6 feet. This is far less than the captain's estimate and does not include consideration for a rising tide and any storm surge.

At approximately 0215 on the morning of the casualty, the captain was awakened by waves striking the hull. He proceeded to the bridge/control room, where he attempted to raise the barge. The lèg on the port bow would not move, and all efforts to move it failed. When he had exhausted all possibilities of getting his vessel above the rough waves, the captain realized the peril the men were in and went through the galley and contract crew's quarters ordering everyone to don a life jacket and go out onto the platform. He then raised the stern about three feet, moving the barge closer to the platform and facilitating evacuation.

After raising the stern, the captain, at great risk to his own safety, again passed through the galley area to ascertain that the vessel had been abandoned. He found three men in the dining area and repeated his order to don life jackets and move onto the platform. Had the captain not made the second trip through the vessel, all three men very probably would have still been in the dining area when the vessel capsized. As it was, however, a large wave raised the barge off the bottom before any of these men reached the platform. As the vessel settled back onto one or two of its legs, another wave swept it over onto its side, dropping the four men and all the equipment from the deck into the water. The barge then driftec into another platform nearby.

By midday three of the men had been recovered suffering varying degrees of injury. (The cook, one of the three, probably owes his life to the fact that he had earlier stumbled upon the life jackets.) The fourth man, the foreman of the sandblasting crew, remains missing and is presumed dead.

A number of questions are raised by this incident:

1. Was the failure of the port bow leg to function the result of the heavy seas' putting too much pressure on an overextended bearing surface, effectively locking it against its jacking funnel?
2. Should more attention have been paid to the deteriorating weather conditions and action to raise the barge been taken sooner?
3. Would drills and emergency instructions for the members of the paint crew have made them any more self-sufficient in the face of the emergency?
4. Can the reader remember occasions when he, or a vessel he's been aboard, has been in a similar perilous situation and escaped mishap by sheer good fortune? ‡

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. Calcium carbide must never be stowed near

A. copper.
B. foodstuffs.
C. flammable solids.
D. combustible solids.

REFERENCE: 49 CFR 172.101

2. Which vessel must show a masthead light abaft of and higher than its identifying lights?

A. a 55-meter vessel engaged in fishing
B. a 55-meter vessel engaged in trawling
C. a 100-meter vessel not under command
D. a 20-meter vessel engaged in pilotage duty.

REFERENCE: Navigation Rules

3. An advantage of dry chemical over CO_2 fire extinguishers is

A. its greater range.
B. its effectiveness on more types of fires.
C. its cleanliness.
D. all of the above.

REFERENCE: Marine Fire Protection, Firefighting and Fire Safety

4. A relative bearing is always given from

A. true north.
B. magnetic north.
C. the vessel's beam.
D. the vessel's head.

REFERENCE: Bowditch

5. Which of the following statements about the use of portable electric lights on tankers is correct?

A. The fixture must be explosion-proof, and the line must have a ground wire.
B. They can be used only when the compartment is gas-free.
C. They must be explosion-proof, self-contained, battery-fed lamps.
D. No portable electric equipment of any type is allowed.

REFERENCE: 46 CFR 35.30-30

ENGINEER

1. A reheater in an air-conditioning system is designed to control the

A. chilled water temperature.
B. dew point temperature.
C. primary air temperature.
D. dry bulb temperature.

REFERENCE: Dossat

2. The delivery rate of an axial piston hydraulic pump is controlled by varying the position of the

A. sliding block.
B. pintle.
C. reaction ring.
D. tilting box or swash plate.

REFERENCE: Vickers Hydraulic Manual

3. Intercooling of a multistage air compressor has the advantages of reducing the work of compression on the succeeding stages and

A. condensing part of the original water vapor content.
B. reducing the maximum piston loads.
C. increasing the volumetric efficiency.
D. all of the above.

REFERENCE: Harrington

4. The final heating of feedwater in a flash-type distilling plant is done by

A. heat exchange in the first-stage feed box.
B. vaporization in the first-stage fluid chamber.
C. heat exchange in each stage of the distiller condenser.
D. the admitting of low-pressure steam to the feedwater heater.

REFERENCE: Harrington

5. Excessive oil foaming in the crankcase of a refrigeration compressor is most likely to occur when the compressor

A. has run continuously for a long period.
B. suction pressure is below normal.
C. oil level is below normal.
D. starts after a long idle period.

REFERENCE: Dossat

ANSWERS

DECK
1.A;2.B;3.A;4.D;5.C
ENGINEER
1.D;2.D;3.D;4.D;5.D

The Mourning of the TITANIC

by Ensign Michael A. Cicalese
International Ice Patrol

"Today marks the 70th anniversary of the tragic sinking of the British luxury liner RMS TITANIC after striking an iceberg in position 4046 N 5014 W. We take pause to remember the more than 1,500 lives lost. May they rest in peace."

On April 15, 1982, the International Ice Patrol will add the above passage to the daily message that is broadcast to ships moving through the transatlantic shipping lanes. Each year on this date, this passage is added as a traditional mourning for one of the greatest maritime disasters of all times.

Another tradition is also upheld by the Ice Patrol. Each year on this date, a Coast Guard Hercules C-130 flies some 400 miles southeast of Newfoundland to that forsaken position in the Atlantic, where the Ice Patrol drops a ceremonial wreath, hoping that it will come to rest near the gravesite of the TITANIC, two miles below the surface. The wreath is donated by the Titanic Historical Society.

The flight is over two hours in duration from its take-off point on the Canadian coast. Along the way, the Ice Patrol crew searches for icebergs. It is an unusual way to spend the day. But then again, this day mourns an unparalleled tragedy for those souls aboard the TITANIC honored by the maritime community, as well as the crew of the Ice Patrol. ⚓

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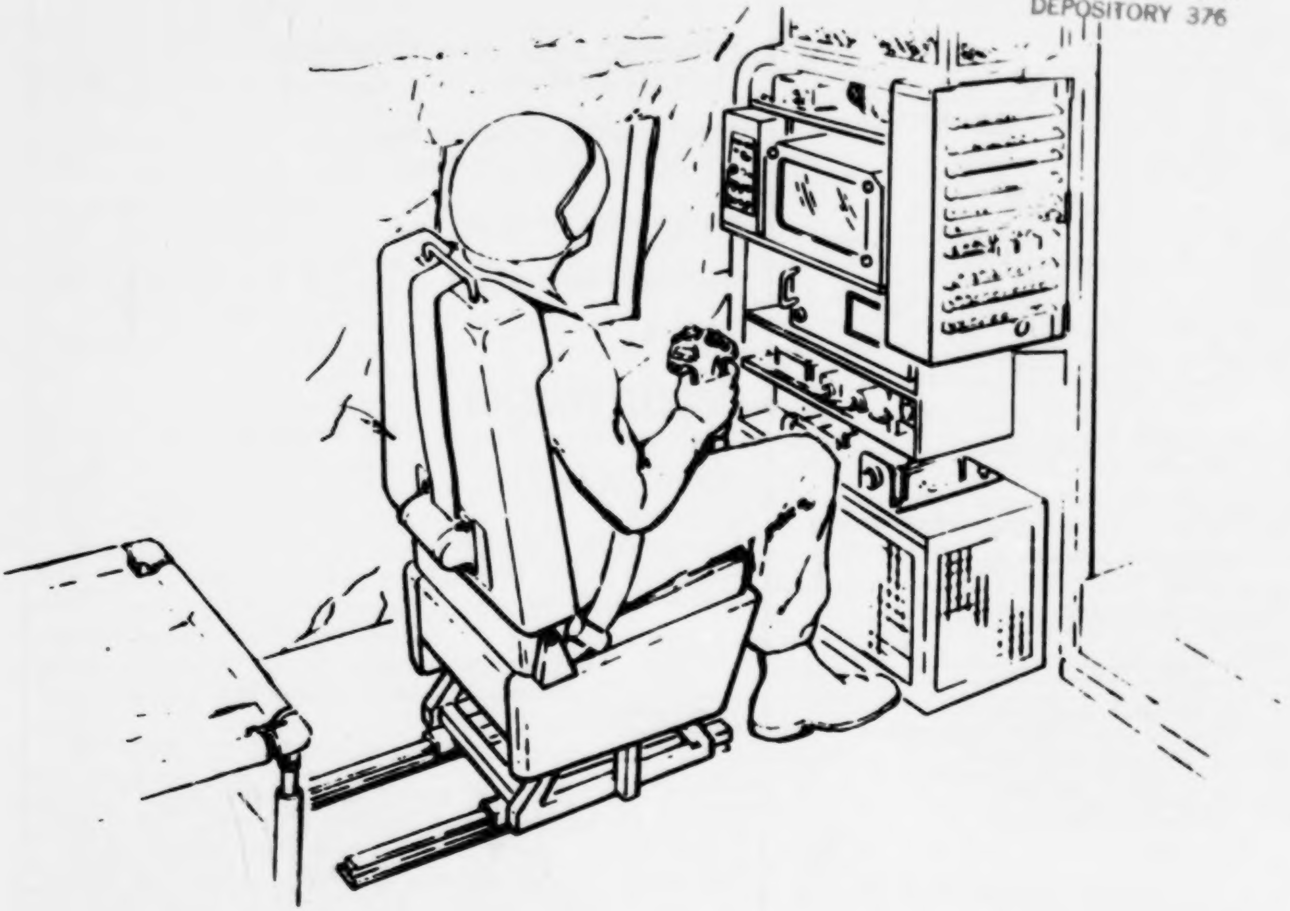

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of the Marine Safety Council

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When you have finished reading this issue, please pass it on.

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cover

No, this helicopter crewman isn't watching TV; he's looking for survivors of a boating accident. The Coast Guard has a new infrared sensor that creates black-and-white TV-like pictures of what it sees. For more on the "FLIR," which "sees" even at night and in conditions of poor visibility, turn to the story beginning on page 146.

Letters to the Editor

Regarding the article in the February 1982 *Proceedings*, "Retro-reflective Material Adds Extra Safety Measure to PFDs," I am in thorough agreement with Mr. Lemley's suggestion that retro-reflective material be added to the PFDs carried aboard recreational boats. It has been known for many years that reflective material increases the chances of quick rescue of individuals in the water.

I would, however, like to make a correction to the statement that "federal regulations require only Type I PFDs to be equipped with retro-reflective material." This is not quite the case, as Mr. Lemley is well aware. A quick review of the PFD requirements for uninspected commercial vessels less than 40 feet in length is in order.

Subsection (b) of Paragraph 25.25-5 of Title 46 of the Code of Federal Regulations (46 CFR 25.25-5) states that all uninspected commercial vessels not carrying passengers for hire, *less* than 40 feet in length must carry a life preserver (Type I), buoyant vest (Type II), or special purpose water safety buoyant device intended to be worn (Type III) [for every person on board].

46 CFR 25.25-15 states that all Type I, II, or III PFDs carried aboard uninspected commercial vessels must have 31 square inches of approved retro-reflective material on the front side and 31 square inches of material on the back side. If the PFD is reversible, as are Type I's, there must be 31 square inches of material on each of the reversible sides.

In short, an uninspected commercial vessel less than 40 feet in length, not carrying passengers for hire, may carry Type II or III PFDs in lieu of Type I's. But these Type II or Type III PFDs must still be equipped with retro-reflective material.

I am not aware of any Type II PFDs that are manufactured with retro-reflective material; however, some Type III's are. Apparently, manufacturers are not aware of the number of small uninspected commercial vessels, particularly fishing vessels, operating in the U.S. Nor is there published information, that I am aware of, on the proper placement of retro-reflective material on Type II PFDs (What is the "front"? What is the "back"?). An addition to Navigation and Vessel Inspection Circular No. 4-80 could correct this situation.

A further note regarding PFD lights. 46 CFR 25.25-13 requires that each PFD, except ring buoys, carried on uninspected commercial vessels engaged in ocean, coastwise, or Great Lakes voyages must be equipped with an approved PFD light, approval number 161.012.

In support of Mr. Lemley's suggestion that retro-reflective material be added to PFDs carried on board recreational boats, I would offer the following suggestion: that regulations be amended to require *all* approved PFDs manufactured after a certain date to be fitted with the required amount of approved retro-reflective material. Thus, over a period of time, as unserviceable PFDs were replaced, all vessels and boats would be carrying PFDs equipped with this proven life-saving material.

Richard C. Hiscock
Editor-Publisher, "Safety
Notes for Fishermen"
North Chatham, Mass.

Editor's note - Mr. Lemley's remarks on PFD requirements were made in the context of recreational boating. As Mr. Hiscock points out, readers should be aware that requirements are different for commercial fishing vessels.

My compliments to Mr. Daniel L. Dewell for the excellent article on the National Strike Force, "Shore Duty that Keeps You Underway," which was published in your March issue. The article not only described strike team duty but also provided good background information on NSF capabilities for use in oil spill contingency planning.

As one who spent some time in NSF coveralls "on the road again," [I was reminded by the article of] my own "sea stories," based primarily on comradeship and teamwork . . . the kind you never forget.

Hugh D. Williams
Marine Environmental
Advisor
Mobil Shipping and
Transportation Co.
New York

RE: "Close Encounters of a Dangerous Kind":

After reading Ron DeMello's letter reiterating the dangers of recreational boaters entering into close-quarter situations with deep-draft vessels in narrow channels or vessels unable to maneuver readily in such channels, I should like to throw in my "sea stories."

Aboard two different deep-draft ships of the same company within a year, I have also witnessed a couple of potentially disastrous situations, both of which occurred in the Elizabeth River-Norfolk area.

While standing by on the bow, we were entertained by a water skier doing figure eights just ahead of our ship, which was doing about 4 - 6 knots through the water. We all wondered if he could make 7 - 8 knots if he took a spill 50 feet or so ahead of our stem. The master and pilot of our ship at the conn must have been thinking likewise!

Then, about six months later while proceeding outbound from Norfolk, on the Elizabeth again, the classic case of a bold sailboater trying to sneak ahead of our ship (doing at least 10 knots) took place. Well, he made it! But not by much. Again, all who witnessed the event wondered how fast he could have tacked with a cockpit full of family or friends, or how soon he could have started his engine had his 5 - 10 knot breeze suddenly dropped to 0 or if he had been headed by a slight wind shift.

In both cases [it is questionable whether] any action of maneuvering by the ships would have [been effective], owing to the time lapses of only seconds in the orders given to the helmsman or engine room from the master or pilot.

I can speak from both the ship/master's side and the boater's side, as I am a keen sailboat person myself when on vacation.

The optical illusion of a large vessel moving what seems to be slowly through the water has fooled me also. With charterers aboard my 40-foot sloop during the Bicentennial tall ships parade, I was asked to maneuver as closely as possible to the Coast Guard vessel EAGLE for photos. There was plenty of sea room (between Block Island and Newport), so I figured I could get quite close. I was quite surprised to find that the EAGLE could have sailed circles around us if she had had the maneuverability. She was catching a lot of wind in her topsails on what was a light airsailing day 50 feet or so above the sea surface.

Hopefully, the public can be made aware of these situations before needless disasters occur. There is a terrible feeling of helplessness aboard the ships when these close-quarter situations occur.

Bob Damrell
Chief Mate
C/V Sea-Land Pioneer

Maritime Sidelights

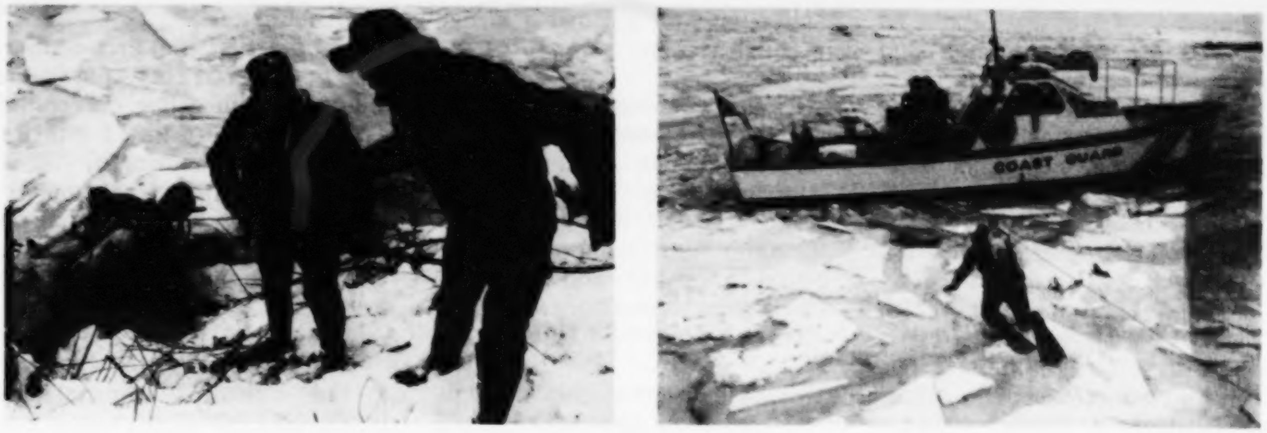
IMCO Soon to Be IMO

The Inter-Governmental Maritime Consultative Organization (IMCO), a specialized agency of the United Nations dealing with world maritime affairs, is going to be renamed on May 22, 1982. On that date, IMCO will become the International Maritime Organization (IMO). This name change reflects the expanding and increasingly diverse role the agency plays. Initially, IMCO was established to consolidate the various forms of international cooperation which had developed over the years in the world of shipping. This purpose has been served well, and the organization has become a focal point for major advances in the safety of life at sea and the prevention of pollution of the world's oceans. In addition, the organization's technical cooperation program, by providing the services of numerous maritime experts, has benefited both developing and developed countries. IMCO has today evolved into an organization best described by its new name—the International Maritime Organization.

Coast Guard Personnel to Receive Humanitarian Service Medal

Coast Guard personnel, along with Navy, Army, and Air Force people, will be awarded the Humanitarian Service Medal for their efforts during rescue and recovery operations following the crash of Air Florida Flight 90 on January 13, 1982. Assisting at the Potomac River site were personnel from Coast Guard stations in the Baltimore-Washington area as well as a helicopter crew and the Atlantic Strike Team divers from Elizabeth City, North Carolina. The Coast Guard remained on the scene until January 23.

The Humanitarian Service Medal was originated in 1977 to recognize individuals who distinguished themselves by direct participation in an



Coast Guard divers search for debris following the crash of Air Florida Flight 90. Photos by Tom Gillespie, U.S. Coast Guard Photo Team

operation of a humanitarian nature. Recipients must have rendered service above and beyond normal duties to relieve human suffering. Qualifying as humanitarian operations are, for example, assistance lent following natural or man-made disasters (earthquakes, floods, hurricanes, conflagrations, etc.) or support or resettlement of refugees or evacuees. Coast Guard personnel have in the past received the medal for such efforts as their assistance following the Mount St. Helens volcano and during Operation Cuban Refugee Relief.

Fire Safety Standards for Passenger Vessels Incorporated in SOLAS 74

Section 362 (C) of Title 46 of the U.S. Code requires vessels on which U.S. nationals embark as passengers at U.S. ports to comply with the 1966 Fire Safety Standards (IMCO Resolution A.108 (ES.III)) if the vessels are over 100 gross tons and have sleeping accommodations for 50 or more passengers. The guidelines in Navigation and Vessel Inspection Circular (NVC) 1-75 directed vessel owners to submit fire control plans to the Coast Guard's Merchant Marine Technical Division before control verification examinations were conducted. The purpose of this was to permit a cursory examination of the ship's arrangement. Such a provision was necessary because the U.S. was unilaterally enforcing fire safety standards which had been adopted by IMCO but had not been ratified by a sufficient number of countries, and there was some concern that governments might not be interpreting the fire safety standards uniformly.

With the coming into force of SOLAS 1974, the 1966 Fire Safety Standards have been incorporated as Part F of Chapter II-2. Inasmuch as these standards are now part of an internationally recognized convention in force, the need for prior plan review no longer exists.

Coast Guard Headquarters will no longer conduct foreign passenger vessel plan review. Owners and operators should be advised that plan submittal is no longer required. In those cases where an application for control verification concerns a ship which does not have a valid SOLAS 1974 passenger ship safety certificate, Headquarters should be consulted on a case-by-case basis.

NVC 1-75 has been cancelled.

SNAME Sponsors Exposition

SNAME, the Society of Naval Architects and Marine Engineers, has been holding annual meetings for 89 years. Each meeting has been planned around technical sessions on the latest developments in the maritime industry.

At its 90th meeting, SNAME will be sponsoring its first "International Maritime Exposition" in conjunction with the technical program.

Further details on the meeting and exposition, which will be held November 17 - 19, 1982, at the New York Hilton Hotel, are available from the REBER-FRIEL COMPANY, 216 Goddard Boulevard, King of Prussia, PA 19406.

Petroleum/Chemical Carriers Courses Set at Maine Maritime Academy

The Maine Maritime Academy Center for Advanced Maritime Studies (CAMS) has scheduled a number of training programs of interest to petroleum and chemical carriers.

In collaboration with the College of Nautical Studies of Southhampton, England, and Wilson Walton International Limited of Croyden, England, Maine Maritime Academy will continue its series of one-week Inert Gas Systems (IGS) and Crude Oil Washing (COW) courses. The next sessions will be conducted at the Academy's new Conference Center in Castine, Maine, during the weeks of August 9 and October 18.

In collaboration with the College of Nautical Studies, the Academy will also sponsor a one-week Petroleum Tanker Safety Course during the week of August 2 and a one-week Chemical Tanker Safety Course during the week of August 16.

Additional information and registration forms are available from Mrs. Doris Ricardson, Executive Secretary and Registrar, CAMS, Maine Maritime Academy, Castine, ME 04421; (207) 326-4311, Ext. 211.

Chemsea Exhibition and Conference Scheduled

Chemsea '83 is the name that has been chosen by the General Council of British Shipping and the Chemical Industries Association for their first joint conference and exhibition.

Chemsea '83 will take place in London, England, at the Royal Lancaster Hotel from April 13 through April 15, 1983.

The purpose of the conference is to examine the present and future requirements for the safe handling and transportation of bulk liquid chemicals by sea. It will concentrate on the following broad subject areas:

- the commercial effect of national and international legislation on the chemical trade
- the maintenance of safety in onshore and on-board cargo operations; personnel safety and training
- assessement and minimization of risk
- operational pollution prevention
- contingency planning and emergency response
- the future for chemical shipping.

There will also be an exhibition of products and services connected with chemical shipping.

Further information is available from the Chemsea '83 Conference Secretariat at 30/32 St. Mary Axe, London EC3A 8ET, England.

Gastech Proceedings Available

Gastech Ltd. announces that the "Proceedings" of Gastech 81, the Eighth International LNG/LPG Conference, held in Hamburg in October 1981, are now available from its office in England. The Proceedings are an edited record of the texts of the Conference papers and some 24 hours of presentations, discussions, and panel sessions. The Conference, which drew more than 1,400 registered delegates from 52 nations, covered the main aspects of the supply, marketing, transportation, and storage technology for liquefied natural gas and liquefied petroleum gas.

Copies of the Proceedings can be ordered for £50 or the equivalent in other currencies from Gastech Ltd., 2 Station Road, Rickmansworth, Herts WD3 1QP, United Kingdom.

Gastech also announces that meeting dates have been set for the following two conferences:

Gastech 82
The Ninth International LNG/LPG Conference and Exhibition
Palais des Congrès, Paris
October 5 - 8, 1982

Ro-Ro 83
The Sixth International Conference and Exhibition on Marine Transport using Roll-on, Roll-off Methods
Svenska Mässan Stiftelse
Gothenburg, Sweden
May 17 - 19, 1983

For further information, contact the Conference Secretariat at the address for Gastech Ltd. shown above.

Coast Guard Academy to Get New Superintendent

Rear Admiral-Selectee Captain Edward Nelson, Jr., has been chosen to succeed Rear Admiral Charles E. Larkin as Superintendent of the U.S. Coast Guard Academy in New London, Connecticut.

Captain Nelson is himself a 1953 graduate of the Academy. He is presently serving as Chief of Staff in the Seventeenth Coast Guard District, Juneau, Alaska.

The change of command will take place this summer. Rear Admiral Larkin, who will be promoted to Vice Admiral, will go to San Francisco to become Commander of the Pacific Area and the Twelfth Coast Guard District. ⍊

The following items of general interest were published between February 23, 1982, and March 22, 1982:

Final rules: CGD 7-82-06 Drawbridge Operation Regulations; Broward River, Florida; Revocation, March 1, 1982. CGD 81-071 Drawbridge Operation Regulations; Little Potatoe Slough, California, March 8, 1982. CGD 5-81-09R Drawbridge Operation Regulations; Anacostia River, District of Columbia, March 11, 1982. CGD 7-82-07 Drawbridge Operation Regulations; St. Lucie Canal (Okeechobee Waterway, Florida, Ashepoo River, South Carolina, Ocowee River, Georgia), Revocation, March 15, 1982. CGD 77-028 Anchorage Grounds, Mississippi River below Baton Rouge, Louisiana, March 22, 1982.

Notices of proposed rulemaking (NPRMs): CGD 5-81-10R Drawbridge Operation Regulations; Roanoke River, North Carolina, February 25, 1982. CGD 7-82-02 Drawbridge Operation Regulations, Clearwater Harbor, Gulf Intercoastal Waterway, Pinellas County, Florida, March 1, 1982. CGD 7-82-03 Drawbridge Operation Regulations; AIWW, Palm Beach County, Florida, March 1, 1982. CGD 7-82-04 Drawbridge Operation Regulations; Hillsborough River, Tampa, Florida, March 1, 1982. CGD 2-81-04 Drawbridge Operation Regulations; Illinois Waterway, Illinois, Bridges (highway and railroad) at Pekin, Peoria, and Joliet, Illinois, March 1, 1982. CGD 82-034 Drawbridge Operation Regulations; Lagoon Pond, Martha's Vineyard, Massachusetts, March 8, 1982. CGD 13-82-01 Seattle Opening Day Yacht Parade and Crew Race, March 8, 1982. CGD 5-81-18R Drawbridge Operation Regulations; Chickahominy River, Barret's Ferry, Virginia, March 11, 1982. CGD 11-79-02 Safety Zones Around Structures on the Outer Continental Shelf, March 15, 1982. CGD 82-021 Drawbridge Operation Regulations; Genessee River, New York, March 22, 1982.

Rule extension: OST-68 Yacht Documentation Fees, March 1, 1982.

Notices: CGD 82-022 Proposed Railroad Bridge along the Bronx Shoreline of the Harlem River, New York, New York, Notice of Public Hearing, March 1, 1982. CGD 81-097 Marine Sanitation Devices, Extension of Comment Period, March 4, 1982. CGD 82-026 Notice of Qualification of Texasgulf Inc. as Citizen of the United States, March 11, 1982. CGD 82-028 Existing Tank Vessels 20,000 to 40,000 Deadweight Tons, Notice of Intent to Develop Regulations and Prepare an Environmental Impact Statement, March 18, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Coast Guard Overseas Marine Inspection Offices to Close (CGD 82-031)

In the 1970s the Coast Guard began carrying out commercial vessel safety activities (such as inspection of new construction and conversion, as well as periodic inspection) from overseas locations. The Marine Inspection Offices in Rotterdam (the Netherlands), Kobe (Japan), and Singapore performed Coast Guard functions in Europe, Africa, and the Middle and Far East. These offices were closed April 1, 1982, and their activities reassigned as follows:

Inspection activities in the Far East, Pacific Basin, and the Indian Ocean as far as the Arabian Sea were taken over by the Marine Safety Office (MSO) Honolulu, Room 1, 433 Ala Moana Boulevard, Honolulu, HI 96813.

Inspection activities in Western Canada were taken over by MIO Seattle, 915 Second Avenue, Seattle, WA 98174.

Inspection activities in Western Mexico above 20° North latitude were taken over by MSO San Diego, 2710 Harbor Drive, San Diego, CA 92101.

Inspection activities in South and Central America, the Western Coast of Mexico below 20° North latitude, and all of the Eastern Coast of Mexico, were taken over by MIO New Orleans, F. Edward Hebert Building, 600 South Street, New Orleans, LA 70130.

Inspection activities in Europe, the Mediterranean Sea, the Red Sea, the Persian

Please enclose your mailing label when sending in a change of address.

Gulf, the Arabian Sea, and all of Africa were taken over by MIO New York, Battery Park Building, New York, NY 10004.

Inspection activities in Eastern Canada were taken over by MSO Boston, 447 Commercial Street, Boston, MA 02109.

Any company in need of overseas inspection services must apply in writing to the appropriate Officer in Charge of Marine Inspection as outlined above.

For new construction inspection overseas, the Commandant (G-MVI), U.S. Coast Guard, Washington, DC 20593, should be contacted as before.

For further information, contact LT T. P. Talbot, Jr., at the address in the preceding paragraph.

Obsolete Ring Life Buoy Specifications Revoked
(CGD 80-155a, b)

Coast Guard regulations in Part 160.009 of Title 46 of the Code of Federal Regulations contain specifications for cork and balsa wood ring life buoys. Since these types of life ring buoys are no longer being manufactured, the regulations have become obsolete. In a final rule published on March 11, 1982, the Coast Guard revoked the specifications for cork and balsa wood ring life buoys and made editorial changes throughout Title 46 of the CFR to reflect this revocation. Cork and balsa wood life ring buoys may continue to be used after the revocation, as long as they are in good and serviceable condition. For further information, contact Mr. Frank K. Thompson, U.S. Coast Guard (G-MMT/12), Washington, DC 20593.

Proposed Rule on Second-class Operator Qualification Withdrawn
(CGD 77-204)

In an NPRM published on May 25, 1978, the Coast Guard solicited comments on proposed regulations allowing service on vessels other than towing vessels to be credited toward qualification for the license "second-class operator on uninspected towing vessels." The proposed regulations would have allowed applicants who had experience on large ocean-going vessels to use that experience to qualify for the second-class towing license. Also, a Coast Guard-approved training course could have been used in lieu of required service on towing vessels. Comments on these proposed regulations were generally favorable.

Public Law 96-378 mandated the revision of the entire structure of merchant marine licenses. The Coast Guard felt that the project concerning second-class operators of uninspected towboats would be better handled in the overall review of licensing procedures currently underway. Thus, in a notice published March 15, 1982, CGD 77-204 was withdrawn. The comments submitted on the second-class license project will be considered in the overall review.

For further information, contact CDR Daniel E. Struck, U.S. Coast Guard (G-MVP), Washington, DC 20593.

Vessel Owners Application Requirements Eased
(CGD 79-087)

In the past, vessel owners applying for a certificate of number for their vessels were required by the issuing states or the Coast Guard to furnish information on their date of birth and citizenship. The Coast Guard has now determined that the need for this information is not sufficient to justify the requirement for its disclosure and collection. States that require the information may continue to collect it. On February 25, 1982, the Coast Guard published a final rule (effective March 29, 1982) which changes regulations so that the date of birth and citizenship are no longer required information for obtaining a certificate of number.

For further information, contact Commandant (G-BEL-4), U.S. Coast Guard, Washington, DC 20593.

Outer Continental Shelf Regulations Amended
(CGD 78-160)

Since the 1950s the Coast Guard has regulated fixed structures and artificial islands on the Outer Continental Shelf (OCS) of the United States. Coast Guard regulations cover inspections, construction, arrangement, equipment, operating procedures, casualty reporting, safety zones, and penalties. Their ultimate goal is to preserve life and property on the OCS. These regulations are found in Parts 140 - 147 of Title 33 of the Code of Federal Regulations (Subchapter N).

In September 1978, President Carter signed into law the OCS Lands Acts Amendment, giving the Coast Guard new responsibilities for regulating the OCS. The new law imposed requirements beyond those in Subchapter N.

On March 4, 1982, the Coast Guard published a final rule which reflects the changes mandated by the OCS Lands Act Amendment. The new regulations will ensure that foreign mobile offshore drilling units operating on the OCS meet standards comparable to those met by U.S. units. The new regulations implement provisions for the manning of OCS units by U.S. citizens and generally improving the safety of activities on the OCS.

For further information, contact LT Dennis J. Cashman, U.S. Coast Guard (G-MVI), Washington, DC 20593.

Proposals for Prevention of Oil Pollution by New and Existing Tank Barges Withdrawn (CGD 75-083 and 75-083a)

On June 14, 1979, the Coast Guard published "Proposals for Prevention of Oil Pollution on New and Existing Tank Barges." The proposals were based on a series of studies done by the Coast Guard and contained provisions for a double-hull construction standard for new tank barges designed to carry oil in bulk. Another proposal called for a phase-out of certain existing single-hull tank barges. In response to the comments submitted and the conclusions of a National Academy of Sciences study, the proposals were withdrawn on March 22, 1982. The Coast Guard will, however, continue to search for alternative methods of preventing pollution from tank barges.

For further information, contact LCDR A. Spackman, U.S. Coast Guard (G-MMT-1/12), Washington, DC 20593.

Correction

In the Keynote entitled "Is it a Bridge or a Boat?" (February 1982, page 33) concerning opening signals for drawbridges (CGD 75-237), it was incorrectly stated that the proper signal for a situation where the bridge cannot be opened or must be closed immediately is four short blasts of the whistle. The correct signal is five short blasts.

It should also be noted that a green light may be used in place of a white light for visual signaling purposes and that a long blast should be interpreted as the COLREGS "prolonged blast" (4 - 6 seconds).

Actions of the Marine Safety Council

March meeting

CGD 82-015 Casualty and Accident Reporting Thresholds

Boating accidents must currently be reported if they result in monetary damage of $200 or more. The National Boating Safety Advisory Council has recommended that the Coast Guard raise this figure. At its March meeting, the Marine Safety Council approved a work plan to increase the minimum to $500 for accidents not involving personal injury. The schedule calls for an NPRM to be submitted to the Federal Register in June.

Error in Structural Fire Protection Regulations Corrected

In 1977 the Office of the Federal Register switched from hot-metal type to a computerized printing process. In doing so, however, it inadvertently introduced numerous typographical errors throughout the Code of Federal Regulations (CFR).

Such an error was recently brought to the attention of the Coast Guard's Merchant Marine Technical Division. The headings of tables 72.05-10(f) and 72.05-10(g) in Subchapter H of Title 46 of the CFR are incorrect as they appear in the 1978 through 1981 editions of the CFR. The correct headings should be:

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The Office of the Federal Register has been requested to take appropriate corrective action. The correct headings will be restored to the tables beginning with the 1982 CFR edition.

Anyone finding a similar misprint should notify the Marine Safety Council (G-CMC), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-1477.

Coast Guard Testing Performance of PFD Lights

On July 2, 1979, the U.S. Coast Guard published final regulations requiring certain commercial vessels to have Coast Guard-approved PFD (personal flotation device) lights on life preservers, buoyant vests, and wearable marine buoyant devices by June 30, 1980. Navigation and Vessel Inspection Circular (NVC) 4-80 provides further information on how the lights should be used with these devices.

Before the lights are approved, they undergo a series of tests to ensure that they meet at least minimum Coast Guard requirements. In addition, a percentage of each lot of lights produced is subjected to quality control tests to determine whether the lights being produced will operate properly. Unfortunately, neither of these test programs can duplicate actual in-use conditions.

Many of these lights have now been in service for almost two years. In order to determine how well the lights withstand actual in-service conditions, the Coast Guard is instituting a voluntary program of substituting new PFD lights for PFD lights in service. Under this program, a selected vessel operator may exchange a small number of PFD lights on board for new PFD lights of the same or a similar type. The replaced lights will be forwarded to Coast Guard Headquarters, where they will be subjected to an operational test. The results of this test will be used to determine if the lights are performing adequately in service and will indicate any changes that should be made to the PFD light approval requirements.

The Coast Guard will obtain a number of approved PFD lights of various types and distribute them to certain Marine Inspection Offices (MIOs) and Marine Safety Offices (MSOs) around the country. The distribution will be made in such a way that varying climatic conditions and vessel service types will be represented.

In the course of regular vessel inspections, marine inspectors will offer to exchange new PFD lights for the old PFD lights on board the vessel. The vessels will be selected by the MIO/MSO staff in such a way that the lights replaced reasonably represent the range of inspected vessel types in that zone. The following guidelines apply to the exchange of PFD lights:

- The exchange is voluntary for the operator. The operator may decline to participate in the program without penalty.
- Both new and old lights involved in the exchange will be complete with power source.
- The operator wll not be held responsible if any of the old lights, when tested, are found to be inoperative or otherwise not in conformance with the regulations.
- If the operator agrees to the exchange, the new lights provided will be of the same type as the old lights, unless the operator agrees to accept another type of light.
- The actual selection of old lights will be made by the inspector. Selected lights and power sources should be at least one year old, but no light selected should have a power source that is more than six months past its expiration date. The selection will otherwise be random.
- The number of lights exchanged on any vessel will not normally exceed 10 percent of the number of lights on board.

When all of the new lights provided to the MIO/MSO have been exchanged for old lights, the old lights will be forwarded to Coast Guard Headquarters for examination and testing. The lights will be grouped and identified as to the inspection zone and type of vessel from which they were taken. Identification of the vessel by name is not necessary.

Any observations as to the suitability of various PFD light designs are encouraged. Comments should be directed to Commandant (G-MMT-3/12), U.S. Coast Guard, Washington, DC 20593.

A "Burning" Issue: Ocean Incineration

by Frits Wybenga
Chemical Engineering Branch
Cargo and Hazardous Materials Division

The United States currently confronts a serious hazardous wastes disposal problem. The Environmental Protection Agency (EPA) estimates that, in 1980, 57 million metric tons of industrial hazardous wastes were produced. National attention has been focused on the problems inherent in current waste disposal procedures by such cases as Love Canal in Niagara Falls and the Chemical Control Corporation fire in Elizabeth, New Jersey. At the same time, through national legislation such as the Resource Conservation and Recovery Act (RCRA), more attention is being given to the proper disposal of hazardous wastes.

Some hazardous wastes are incinerable. EPA regulations implementing RCRA requirements prohibit what was previously the most common method of disposing of such materials —putting them in landfills. High-temperature incineration with a destruction efficiency of at least 99.9 percent is one effective method of destroying hazardous wastes. The U.S. currently faces a deficiency in land-based hazardous waste incineration capacity. As public concern over potential hazards increases, creating new land-based facilities or even expanding existing ones is becoming a major problem.

Ocean incineration offers an alternative to land-based incineration. Presently, there are only two incinerator ships operating in the world. Both of these vessels operate out of Europe. U.S. experience with incinerator ships stems from the burning of U.S.-generated wastes on board the M/T VULCANUS. The VULCANUS has visited the U.S. on several occasions to burn an industrial waste, Herbicide Orange, and, most recently, PCBs.

In February 1980 an interagency work group including representatives from the Maritime Administration, the Environmental Protection Agency, the Coast Guard, and the National Bureau of Standards was convened to resolve many of the issues surrounding ocean incineration and to possibly expedite the development of U.S.-flag incineration vessels. The work group completed its report in September 1980. Among the issues considered were:

1) the environmental acceptability of ocean incineration,

2) the economic feasibility of developing U.S.-flag incinerator vessels,

3) what financial assistance the government can provide from existing Federal

programs to encourage the development of U.S-flag incinerator vessels, and

4) what regulations apply to an ocean incineration operation.

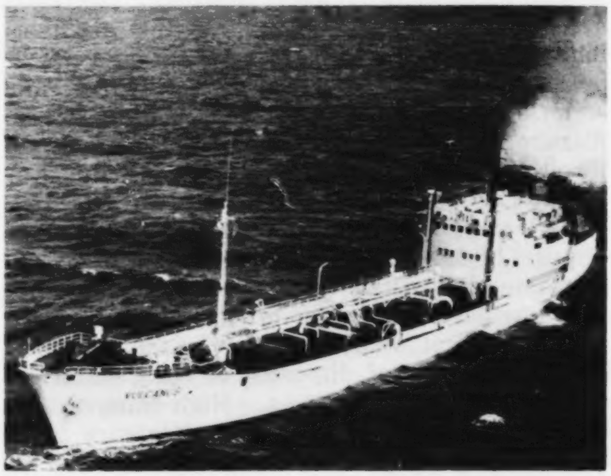
Incineration is an effective means of disposing of many ignitable wastes. Typically, these substances are predominantly made up of carbon and hydrogen and may also include such elements as sulfur, oxygen, chlorine, and nitrogen. These wastes may be burned on land or at sea. The economic advantage of ocean incineration becomes most pronounced in the burning of chlorinated hydrocarbons (carbon tetrachloride, chloroform, ethylene dichloride, PCBs, etc.). When chlorinated hydrocarbons are burned, carbon dioxide, water, and hydrogen chloride are produced. The hydrogen chloride renders the emissions from an incinerator acidic. A land-based incinerator burning chlorinated hydrocarbons would be required to "scrub," or clean, the incinerator gases in order to remove hydrogen chloride. This is a costly process requiring large quantities of an alkali material to neutralize the hydrogen chloride that is collected. The scrubbing process, in turn, also presents its own waste disposal problems.

What about the environmental consequences of ocean incineration? That question has been studied in both the U.S. and Europe. When chlorinated hydrocarbons are burned, the emissions from the incinerator may contain as much as five percent hydrogen chloride. (This figure will, of course, vary according to the amount of chlorine in the waste being burned.) The temperature of the emissions will be on the order of 1,200°C. Since the hot gases emitted by the incinerator are lighter than the surrounding air, they rise, in the form of a plume. As the plume cools, the gases become heavier and ultimately fall to sea level. In the course of rising and falling, however, the plume gases are greatly diluted by the ocean air. The plume generally touches down to sea level several kilometers away from the ship.

During a burn, an incinerator ship maintains a course which provides a relative wind which keeps the incinerator exhaust from settling on the ship. The majority of the hydrogen chloride falls into the sea within 5 to 10 miles of the incinerator ship. In the sea, the hydrogen chloride is neutralized by the buffering agents in the sea water. The hydrogen chloride is dispersed over a large area, and the effects of the hydrogen chloride entering the sea are so small they cannot be measured.

In tests with the VULCANUS in 1977, the maximum sea-level hydrogen chloride concentration measured downwind of the ship was 10 parts per million (ppm); the most frequently measured maximum values were less than 5 ppm. Concentrations of hydrogen chloride in the air more than 10 miles from the ship were reduced below detectable limits (0.005 ppm). The maximum allowable hydrogen chloride concentration for humans in a work area is 7 ppm. Short-term exposure to the low concentrations of hydrogen chloride measured at sea level poses no hazard to personnel or birds in the area.

What about the economic feasibility of developing U.S.-flag incinerator ships? Ocean incineration is an economically attractive alternative to land-based incineration because it eliminates the need to scrub incinerator emissions. A second plus is the avoidance of the costs and political difficulties involved in developing a site on land. A 1978 cost comparison between ocean and land-based incineration showed at-sea incineration to be the less costly option, at $80 to $91 per metric ton. Land-based incineration was shown to cost more than twice as much. Although many businesses are reluctant to divulge the volume of waste they produce, several studies have shown that there is sufficient waste to ensure the economic viability of incinerator ships devoted to U.S. service.



Although the U.S. has yet to develop an incinerator vessel of its own, the M/T VULCANUS, a European ship, has on several occasions burned U.S.-generated wastes.

Two categories of liquid waste are envisioned for disposal on board incinerator ships: the normal waste streams resulting from the production and use of organic chemicals (chemicals derived from petroleum, natural gas, etc.) and substances whose further use has been prohibited because of the potential hazard to the environment. Examples of substances in the latter category are Herbicide Orange, DDT, and PCBs. There will be a short-term need for incinerator ships for the purpose of disposing of these special chemicals; in the long run, however, the primary business of incinerator ships will be disposal of the waste streams coming from the normal production and use of organic chemicals.

Given the need for and the environmental acceptability of ocean incineration, what financial assistance is available for the development of U.S. ocean incineration vessels? The group evaluated the various Federal financial assistance programs managed by the Maritime Administration and other agencies. It was concluded that, without legislative amendments, incinerator ships were not eligible for direct subsidies; they were, however, eligible for Federal loan guarantees granted by the Maritime Administration.

Besides the financial role, what is the Federal government's role in regard to incinerator ships? The government's concerns are basically safety- and environment-related. The agencies most directly involved are the Coast Guard and EPA. The Coast Guard ensures that incinerator vessels are constructed and operated safely and in accordance with environmental requirements. It also determines whether a chemical waste can be safely carried on an incinerator ship. Since many of the liquids carried will be hazardous, the requirements applied are those for Self-Propelled Vessels Carrying Hazardous Liquids found in Title 46 of the Code of Federal Regulations, Part 153 (46 CFR 153). In some cases, however, these requirements are not relevant or do not address certain arrangements which are unique to incinerator ships. In those situations, arrangements are approved on a case-by-case basis.

Foreign incinerator ships entering U.S. waters are generally accepted on the basis of certification by the government of registry combined with Coast Guard verification of compliance with international standards. While incinerator ships are in port, the Coast Guard also has responsibility for ensuring that proper cargo transfer procedures are followed and pollution prevention requirements are adhered to. The Coast Guard is currently participating in the development of internationally recognized standards for incinerator vessels through the Inter-Governmental Maritime Consultative Organization's Subcommittee on Bulk Chemicals.

The Environmental Protection Agency has responsibility under the Marine Protection, Research and Sanctuaries Act for ensuring the acceptability of the environmental aspects of ocean incineration. Accordingly, EPA designates open ocean sites for at-sea incineration with an eye to minimizing the effects on marine life and avoiding fishery areas and regions of heavy commercial or recreational activity. A site has been designated in the Gulf of Mexico and another proposed for the North Atlantic. A third is being considered for the Pacific. For each ship, EPA approves the incinerators after monitoring test burns. It also determines the suitability of a particular waste for incineration at sea. Wastes containing radioactive materials or more than trace concentrations of heavy metals such as lead, mercury, cadmium, or arsenic are prohibited. EPA issues permits for each category of waste to be burned at sea. For certain special substances such as PCBs, the agency requires that a research burn be conducted. During a research burn, samples of the incinerator emissions are taken and analyzed for specific chemical compounds. Once it has been demonstrated that a substance can be satisfactorily destroyed, the vessel concerned is issued another permit for future burns of the special substance. The permit specifies incinerator operating requirements and a minimum destruction efficiency. EPA shares with the Coast Guard responsibility for ensuring that a burn is carried out properly. Typically, this effort might include Coast Guard overflights, ship riders, and onshore reading of data generated during the burn.

The interagency report has generated a great deal of interest in ocean incineration. Since the release of the report, a number of incinerator proposals have been brought forward. The interagency work group has since evolved into an Interagency Review Board which seeks to expedite the development of U.S.-flag incinerator vessels. The Maritime Administration is presently very close to issuing its first loan guarantee for the construction of two U.S.-flag incinerator ships. The vessels are scheduled to be completed in mid-1983 and are intended to operate out of the port of New York.

FLIR:

Turning Night into Day

by LCDR Jerry L. Millsaps
Sensor Technology Branch
Systems Technology Division

"Mayday, Mayday, Mayday, this is the JOLLY ROGER. I'm taking on water! Send help fast! I'm three miles off the northeast point of Rock Island."

No more radio transmissions are heard. It is midnight. The weather is terrible—400 feet overcast, ¼-mile visibility, winds 5 to 10 knots, and seas 2 to 4 feet. The local Coast Guard radio station notifies the Rescue Coordination Center that the JOLLY ROGER is in trouble. The controller dispatches a small boat and a helicopter, but he realizes that it will be very difficult to locate a small vessel in that kind of weather. If the boat sinks, the search party will be looking for an even smaller target—people. In the cold ocean water, the boat's crew will quickly die of exposure.

But wait—there is a glimmer of hope. The helicopter has a new sensor on board. It is called "FLIR" (Forward-Looking Infrared). It is a prototype system that has been in operation only a month, and it has already located one small boat at night. There is a chance for the JOLLY ROGER. The FLIR greatly increases the probability that it will be found.

The helicopter arrives on the scene before the small boat and starts a search. The pilots are busy. One is flying the helicopter, and the other is double-checking their position. Rock Island is 1,500 feet high, 500 feet high at the shoreline. The helicopter, flying at 400 feet below the overcast, would certainly lose in a run-in with the island. When the pilots look outside, all they can see is darkness. When the searchlight is turned on, only a milky white haze is seen. But in the cabin, the crewman sits in front of a TV screen. He sees small wave action on the water. Occasionally, a sea gull lifts off from the water, frightened by the noise of the copter. The helicopter has been searching for about a half hour when, suddenly, the crewman sees an image on the TV screen. He directs the pilot to the position. The pilot flies over at 200 feet but sees nothing. The crewman sees on the FLIR monitor three persons hanging on to an overturned vessel. The pilot does a "beep," a procedure for coming to a hover over the water. The crewman directs the copter back over the capsized boat. Three lives are saved.

The scenario just described is based on an actual incident. Only the identity of the vessel and the place where the incident took place have been changed.

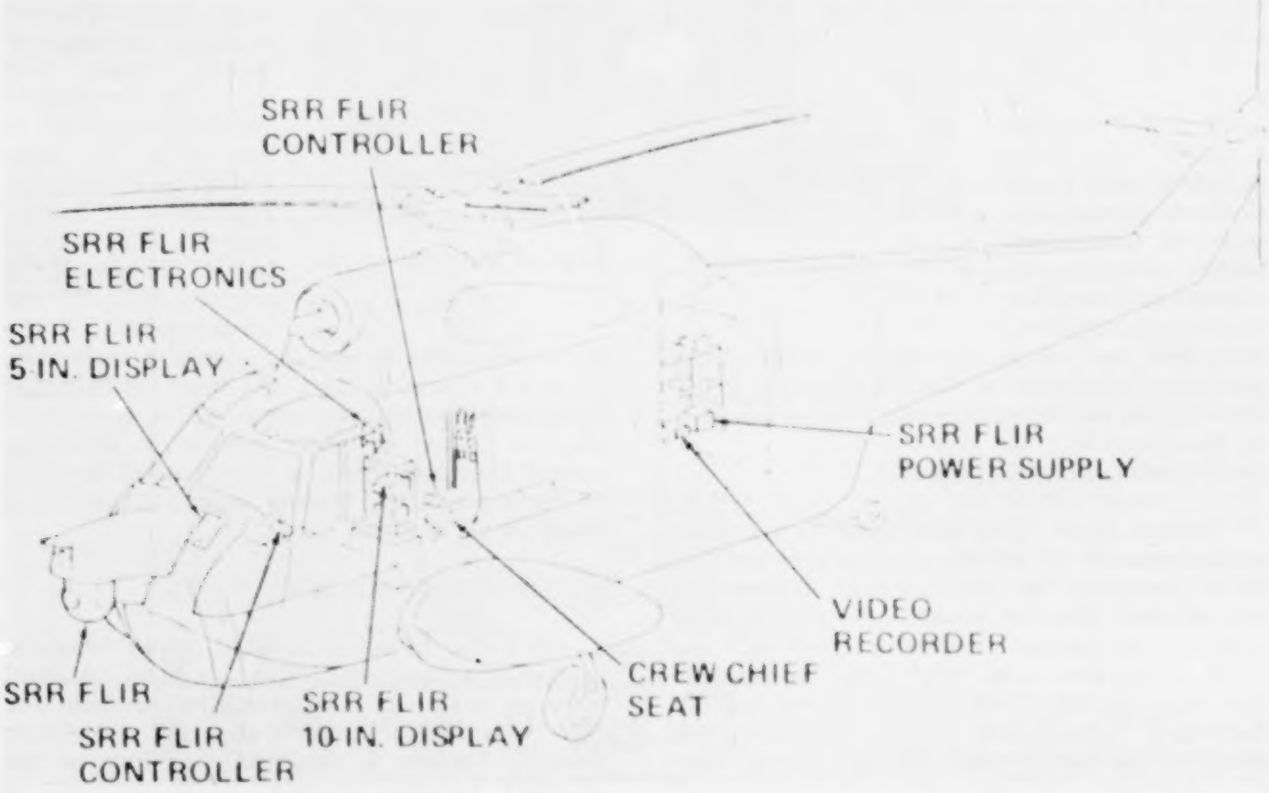
The Coast Guard has been operating a prototype FLIR since June 1981. It was installed on an HH-52A helicopter by Northrop Electro-Mechanical Division of Anaheim, California. The Coast Guard is now in the process of evaluating the FLIR to determine the feasibility of deploying it on the new HH-65A helicopter being built by Aerospatiale Helicopter Corporation of Grand Prairie, Texas.

The FLIR is an infrared sensor capable of converting what it senses into an image on a TV screen. The image is similar to a black-and-white TV picture. Because it senses heat variances in objects it sees, the FLIR "images" as well at night as during the day—sometimes better.

The Coast Guard is interested in the FLIR primarily for Search and Rescue (SAR) missions during low visibility and nighttime operations. It also plans to use the FLIR in marine environmental protection, enforcement of laws and treaties, and various other operations.

The evaluation process consists of transferring the FLIR among various Coast Guard air stations to allow the maximum number of personnel to learn of its capabilities and to determine its performance under widely varying environmental and operational conditions. The process started in June 1981 and will end in June 1982. To date, Air Stations Los Angeles and Brooklyn have tried out the FLIR. While at Los Angeles, the FLIR played a role in two rescues. One of them was the basis for the scenario depicted at the start of this article.

Air Station Brooklyn received the FLIR in October 1981. During October and November, the FLIR helicopter participated in a Probability of Detection testing program sponsored by the Coast Guard's Research and Development Center in Groton, Connecticut. The testing was designed to predict the probability of detecting objects with the FLIR in actual search conditions. The data is currently being analyzed. While using the FLIR, Brooklyn was also



FLIR was originally called "SSR FLIR," the SSR standing for Short-Range Recovery Helicopter. The diagram above shows the general equipment arrangement.

able to locate—at night—a small vessel that was overdue. In February, Brooklyn conducted cold weather and ice operations with the FLIR in the Great Lakes area, visiting Air Stations Detroit and Traverse City. Reports are that the FLIR will be valuable for finding openings in ice. Plans are to transfer the FLIR to Miami in April for evaluation in the hot and humid climate of that area.

An ideal SAR goal for the FLIR is that it search a fairly large area (10 by 20 miles) in a short period of time (2 hours) with a good probability (78 percent) of locating the target. The goal is an ambitious one and will be difficult to attain. However, the following features are designed with that end in mind:

COMMON MODULE

The Coast Guard's FLIR is a common-module design; that is to say, the main components will be the same as those in all FLIRs ordered by the Department of Defense (DOD). This design was selected because of the traditional support the Coast Guard receives in spares, etc., from its larger DOD sister services. Large numbers of common-module systems will be purchased by DOD in the near future. Thus, the cost of developing and maintaining the system will be lower than it would be if the Coast Guard had its own unique FLIR system.

The FLIR is enclosed in a turret on the nose of the aircraft.

PHYSICAL CHARACTERISTICS

The prototype FLIR is attached to a support on the nose of the aircraft. It is enclosed in a turret assembly that is 16 inches in diameter and weighs about 85 pounds. It will move at 180°/second and has gimbal limits of +30° and -80° in elevation and + or - 90° in azimuth. For stowing, the FLIR window is rotated upward under the turret support structure; this protects the optics from damage during takeoffs and landings. Because most Coast Guard flying is done over the water and close to its surface, the FLIR is sealed off to guard against water damage. Complete submersion of the turret will not damage the FLIR.

FIELDS OF VIEW

Two fields of view (FOV) are provided in the Coast Guard's FLIR. The Wide Field of View (WFOV) has an elevation of 30° and an azimuth of 40°. This view is a compromise between area viewed and detail needed. The area viewed should be large enough to allow a search area to be covered in a reasonable time and still be detailed enough to show a person in the water. A second FOV is provided to give more detail. This Narrow Field of Vision (NFOV) is 10° elevation by 13.3° azimuth, which is a magnification of three and gives much better detail. The idea is to use the WFOV for location and NFOV for identification.

SEARCH TECHNIQUES

To assist the helicopter crew in locating and identifying an object, the FLIR features three different search techniques: manual, scan, and step. In the manual system, movement of the FLIR is controlled by a handgrip-mounted thumbswitch. The rate of turret movement is proportional to the force applied. If the operator wishes to use the scanning technique, he sets a scanning angle and scanning rate; the FLIR then continuously scans within these constraints. Step action is similar to scanning, except that the turret is commanded to move to fixed positions, holding each position for a fixed period of time.

AUTOMATIC TRACKING

Once the target is located, some means is needed to keep it in the FLIR's FOV. Manual tracking would be a laborious requirement for the crewmember; therefore, an automatic tracking feature is provided. As long as the selected target's contrast is 20 percent or greater than that of its background, the FLIR will maintain track.

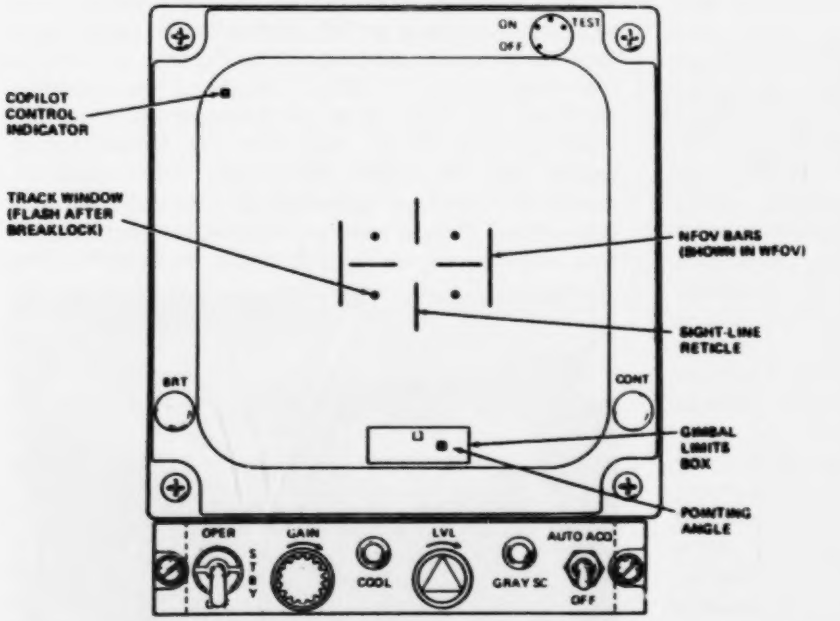
AUTOMATIC ACQUISITION

Locating the target is the main thrust of any search. Because watching a screen can become a tedious, boring task contributing to a possible missed sighting, an automatic acquisition system is being tested. A control is provided for the selection of small to medium-sized or large targets. Once the target size is selected and the automatic acquisition is turned on, the FLIR will automatically lock on a target and track it, provided its contrast is 20 percent or greater than that of its background. This system can be used with any of the three search techniques. The results to date have been promising, but further work is needed.

POLARITY/FOCUS

Other features that the crewmember can use to assist in searching are the FLIR's ability to use either black-hot or white-hot polarity (the search objects are shown in black or white) and its ability to focus the image presented. The two polarities enable the crewmember to select the best polarity for the search conditions present. The focus mechanism provides for sharper, clearer images.

SRR FLIR PROGRAM
CONTROLS AND DISPLAY



This 10-inch monitor, located in the cabin, is one of two used by the crew to operate the FLIR.

VIDEO/SOUND RECORDER

A video/sound recorder has been included to assist in the evaluation program. The tapes can be reviewed at a later time so that the quality of the FLIR can be assessed in a more relaxed, less intense environment. The tape can also be reviewed immediately on the helicopter's displays by using the playback capability of the recorder. The system provides for a signal to alert the crew to any significant sighting.

MONITORS

Two monitors are furnished for the helicopter crew. A 10-inch display is located in the cabin and a 5-inch one in the cockpit. Each monitor has its own handgrip control which enables the crewman and the copilot to manipulate the FLIR. The monitors show the following information:

1) What station has FLIR control
2) The track windows (for centering of the target)
3) NFOV limits when WFOV is selected
4) The gimbal limits of the turret
5) The direction the FLIR is pointing in relation to the nose of the aircraft.

The Coast Guard believes it has a state-of-the-art FLIR. During testing by Northrop, the values recorded for Minimum Resolvable Temperature (MRT) and Noise Equivalent Temperature Difference (NETD)—the first important for detection of targets, the second for distinguishing between targets—were among the best in the industry. This (classified) data shows that the FLIR possesses outstanding thermal sensitivity. This sensitivity, along with the features previously discussed, gives the Coast Guard confidence that a future production model will greatly enhance the chances of locating that small boat or that person in the water at night or when visibility is limited. ⫯

Setting Fires for Safety

Because the Coast Guard is charged with responsiblity for the safety of life and property at sea, it has since July 1969 been conducting an active research program to determine ways of reducing the threat of fire to the marine community. The Fire and Safety Test Detachment (F&STD) in Mobile Alabama, is a unique facility dedicated solely to this purpose. As a sub-unit of the U.S. Coast Guard Research and Development Center, it supports a wide variety of Coast Guard programs, including commercial vessel safety, recreational boating safety, naval engineering, port safety and security, and marine environmental protection.

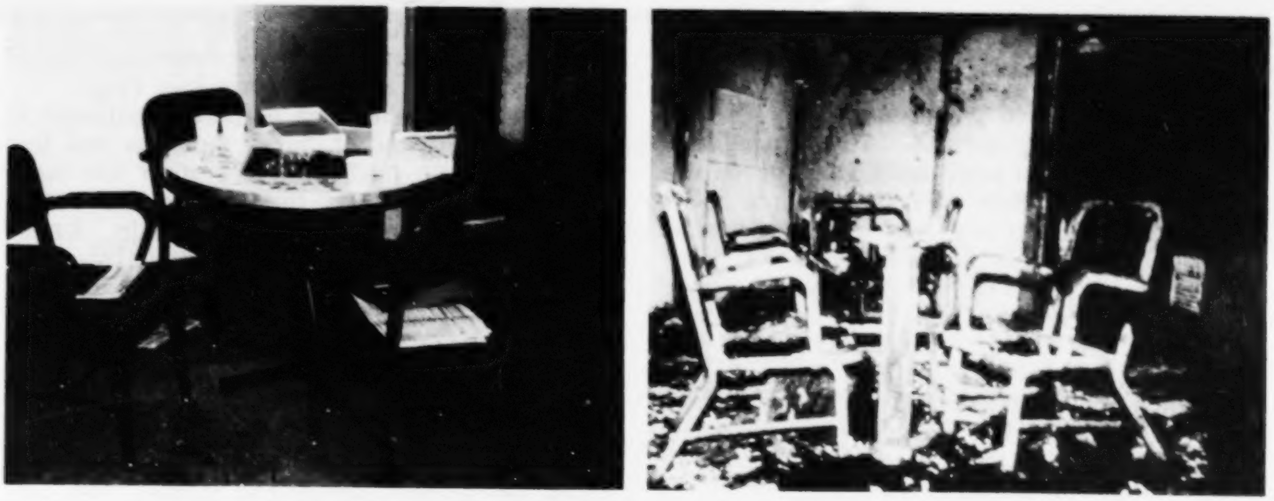
The F&STD's small size belies its impact on merchant marine safety. Consisting of an office and work and storage areas at Coast Guard Base Mobile and a field laboratory on Little Sand Island in Mobile Bay, the test facility has seen many successful research projects in its nearly 13 years of existence. The showpieces of the facility are two ships moored at the field laboratory: the A. E. WATTS, a T-2 tanker, and the MAYO LIKES, a Victory ship. These two ships are subjected to controlled destructive testing by investigators seeking ways to minimize the damaging and often fatal effects of shipboard fires.

Unlike many other engineering disciplines where small models are used to predict behavior of a prototype, fire research has not evolved to a point where an experimenter can draw reliable conclusions from small-scale modeling. Burning characteristics are difficut to model. Scaling the distances between flammable objects and the ventilation systems can result in unrealistic fire spread. It is for this reason that real vessels are used and the results of small-scale testing are used only for gross comparisons of different material and ventilation configurations.

This article will concentrate primarily on the question of how a test program is developed from conception to culmination. The impact of test programs on merchant marine safety will also be discussed.

The Fire and Safety Test Detachment has from the beginning enjoyed excellent industry-government cooperation. While research projects are *developed* by the Coast Guard, they are often *initiated* by an outside party and include several participants. Project proposals are evaluated for their value to the marine industry and the fire protection community, their completeness, and the practicability of using the full-scale facilities. The applied research involves developing, testing, and/or evaluating fire protection concepts, techniques, and equipment to assess their suitability for

An aluminum lifeboat lasted less than a minute against fire.



Before and after: a berthing compartment, complete with standard shipboard furnishings and personal effects.

marine use. All research has the objective of protecting life and property. This goal is also the basis of government and industry cooperation.

The first step in any specially designed test series is to develop a plan. A Coast Guard Research and Development Center Test Director prepares the plan, which includes a synopsis of the information leading to initiation of the project, the reasons for a particular test, project objectives, and alternative approaches to meeting project objectives. There are also sections of the test plan which describe instrumentation, test preparation, and safety precautions. If industry participates in the test, which is often the case, the test plan is prepared in conjunction with the interested parties.

Once the test plan has been approved, F&STD personnel (currently a Chief Warrant Officer and a civilian supervisor) begin the arduous task of preparing for the test. The key to successful test preparation is the teamwork of the personnel assigned to the F&STD. The storekeeper purchases the varied and unusual equipment and supplies. Typical shopping lists include thermocouples, gas analyzers, radiometers, calorimeters, and load cells. The status of contracted work is monitored to ensure compliance with the contract's specifications. When items are not readily available, the assigned damage controlman and machinery technician are called upon to display their resourcefulness. Available to them are welding, sheetmetal, machine, and woodworking shops in which they can construct innovative test fixtures and equipment. Since the test ships are moored at Little Sand Island, these items must be transported across the bay, using two of the mechanized landing craft known as "LCMs." Once the two-ship "fleet" has completed the shuttling of test material and equipment to the ship, the assembly and installment of these components, as specified by the test plan, can begin.

Probably the most important equipment installed at the test site is the instrumentation used to collect data. Transducers are calibrated and installed by the electrician's mate and are used to measure pressures, temperatures, fuel loads, weights, concentrations of oxygen, carbon dioxide and carbon monoxide, wind speed and direction, heat fluxes, relative humidity, and flow rates. The voltages generated by these transducers are centrally received in an air-conditioned instrumentation trailer which must also be transported to the island by LCM. Inside this trailer are two multiplexing scanners, six digital voltmeters, one desktop computer, a system clock, and a series of data acquisition programs. Data from the transducers is switched by the high-speed scanners, read by digital voltmeters, and recorded by the desktop computer, which is capable of receiving data from 120 transducers at a maximum rate of 40 channels per second with scan intervals as short as 2 seconds. Data in graphic or numeric form can be displayed while the test is progressing to allow researchers to monitor variables of immediate interest to them. The test director can also actuate various devices such as a sprinkler or ignitor by pressing pre-defined keys on the computer keyboard. The real power of the system is found in the software. By selecting from the options presented by the computer, the operator, typing his instructions in simple English, can create tailor-made data acquisition programs.

Test day finally arrives. The participants and other interested individuals converge on the test site. What took weeks and more often months to prepare is now subjected to destructive testing, as fires are started in different test areas: berthing compartments, cargo holds, engine rooms, machinery spaces, and tank decks. Quite often this testing results in a particular display of flames and smoke, a display which usually obscures the most significant aspect of the test—the data collection for subsequent analysis at the Coast Guard Research and Development Center.

Deck fires of up to 2,500 square feet of burning jet fuel have been set to evaluate synthetic foams, which proved to be as effective as protein foams, and to evaluate automated monitors under fire conditions which make manual monitors difficult to operate. Because of problems with the reliability of automated fire monitors identified during these tests, they are not accepted for use on merchant vessels. Lifeboats and life rafts have been exposed to fires demonstrating that the life raft's protective container is reasonably effective and that the aluminum lifeboat cannot survive even a one-minute fire exposure. During a separate test, similar results were observed when comparing aluminum and steel hatch covers. Aluminum hatch covers quickly melted, while steel covers remained intact when exposed to a 1,000-square-foot fire.

A 55-gallon drum containing ethyl ether exploded when high temperatures caused internal pressure to build up.

Explosions have been purposely initiated in the 18,000-cubic-foot pump room on the test vessel A. E. WATTS. A system has been developed to suppress these explosions before they do significant damage to the ship. Explosion suppression is effected by an ultra-violet detector which sees the incipient explosion. This activates control circuitry which fires initiators. These initiators rupture a diaphragm, releasing a suppressing agent which is ejected at the flame front.

Steel and polyethylene drums containing such flammable liquids as acetone and ethyl ether have been exposed to fires. The test showed that steel drums failed at high temperatures when increased internal pressure caused the double-rolled seam at the top or bottom to unroll, resulting in catastrophic failure of the drum by jetting and exploding.

Another research project evaluated the performance of three types of light-weight nonstructural bulkhead panels when subjected to a berthing compartment fire. Each test compartment was a simulated Coast Guard cutter berthing compartment with the standard shipboard furniture and personal effects. All panels tested maintained their structural integrity. Proper support of the panels in their joiner system was found to be a vital factor in ensuring that the compartment bulkheads retained their integrity. Future testing will determine the smoke and gas production potential of other types of panels. The objectives will be 1) to rank materials by their smoke and toxic gas production characteristics and 2) to evaluate the contribution of various bulkhead-finish materials to hazards presented by smoke and toxic gases in an escape route in a typical fire situation on board a ship.

Input for the testing program comes from all areas of industry, several Coast Guard offices, and Government agencies. A Marine Fire and Safety research project is, accordingly, a combined effort. Results of the test facility's work have been instrumental in reducing death by fire at sea, reducing fire loss to vessels and cargo, reducing marine insurance rates, improving firefighting techniques, and developing new extinguishing agents, delivery systems, and warning systems. The Coast Guard Fire and Safety Test Detachment will continue to be indispensable in the effort to ensure that marine fire safety keep pace with continuing technological advances. ‡

BWI (Boating While Intoxicated)

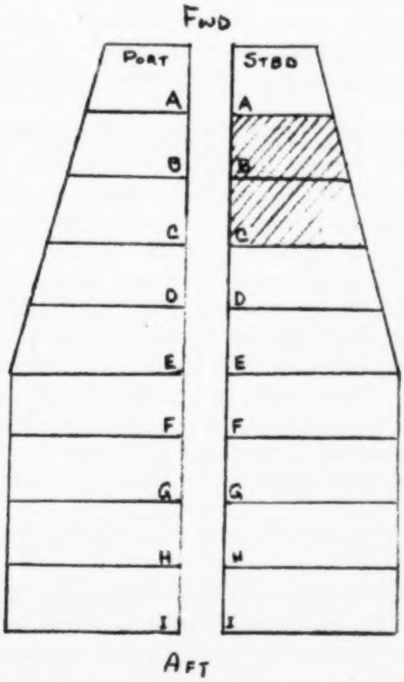
Drunk driving is a topic currently receiving broad coverage in the news media. Stories abound about the carnage on city streets and highways caused by people who attempt to drive after having had too much to drink. The following incidents do not relate to drunk drivers. They show that consumption of alcohol can be a factor in marine accidents as well.

One such incident involved a teenager whose death certificate showed that he was just a few days short of celebrating his 18th birthday. He and four friends had chartered a boat for some sport fishing. While fishing, the victim consumed a large quantity of beer and wine, as well as a half-pint of bourbon. When last seen alive, he was leaning over the starboard rail vomitting. No one actually saw him fall overboard, but his absence was discovered almost immediately thereafter. A search of the vessel failed to produce him, and an extended search of the waters the vessel was in met with the same results. The body was discovered a week later when it washed onto a beach. The autopsy report listed the boy's blood alcohol level as .35%.

Another incident occurred one night when a shore worker was helping clean a cargo vessel's hold in preparation for the loading of grain. He was standing on cover A, which was in place over the hold, while working on covers B and C, which had been moved off to the side on the main deck. The word was passed to clear the area so that cover B could be returned to place. The worker walked straight aft, falling from cover A into the hold. The cause of death listed on the death certificate was fractured skull, lacerated, contused brain, fractured ribs, and contused lungs. The coroner's report showed a blood alcohol level of .17%.

A third incident involved the master of a commercial vessel who went ashore with two crewmembers to have dinner with two local residents. The five people consumed equal portions of four bottles of wine with dinner. After dinner they stopped at a local resident's home for drinks (the master reportedly abstained during this gathering). Upon returning to the vessel, the master attempted to step onto the accommodation ladder, which was set off from the edge of the dock over a bumper cushion arrangement. He missed the ladder and fell between two black rubber fenders. An attempt was made to pass him a safety belt, but he was floating face down in the water and made no attempt to reach for the belt. The coroner's report showed drowning resulting from submersion as the cause of death. A toxicologist's report of tests on a blood sample showed a blood alcohol level of .26%.

A final incident involved a machinist aboard a commercial vessel moored at a cold-storage terminal who entered a refrigerated hold for



ARRANGEMENT OF HATCH COVERS
ON NO. 1 HOLD
(NOT TO SCALE)

▨ INDICATES COVERS NOT IN PLACE

unknown reasons late one evening or early one morning. The air temperature in the hold was approximately 0°F. While he was in the hold, the machinist fell onto some boxes of meat and sustained a severe laceration of the scalp. His body was found lying on its right side in the bottom of the hold near the ladder. A flashlight was found beside the body. The steward aboard the vessel stated that the machinist had been seen in a drunken state prior to entering the hold. He died from head injuries, with exposure to the cold as a contributing factor. His blood alcohol level was .225%.

The following chart, provided by the toxicologist mentioned in one of the above incidents, shows the probable effects of various levels of alcohol in the bloodstream.

LEVEL	EFFECT
0 - 0.10%	Sub-clinical (person looks normal to casual observer). Slight changes detectable by special tests.
0.10 - 0.20%	Emotional instability--decreased inhibitions. Slight muscular incoordination. Slowing of responses to stimuli.

How much can I drink

1. *and stay sober?*
2. *before I can expect trouble?*

1. Ethyl alcohol (the kind in booze) is a depressant (a downer) and has some degree of effect in any quantity. Therefore, you can't be completely sober if you have had anything to drink recently--even though a casual observer may not be able to tell you've been drinking.

2. You are virtually guaranteed trouble if you let your blood alcohol level reach 0.08% or higher. At 0.1%, you are legally intoxicated in most states if caught operating an automobile. With good reason: your chances of being involved in an accident are 6 times greater than a sober person's. As the blood alcohol level climbs beyond this level, the probability of being involved in an accident increases very rapidly. You should definitely not operate a vessel, a vehicle, or machinery or do any dangerous work such as climbing if your blood alcohol level gets over 0.08%.

So, how many drinks is that?

This is a little tricky--it varies from one person to another. It even varies for the same person, depending on whether he is fatigued, what he has eaten, his state of health, and other factors. Generally, body weight is the best indicator. A 100-pound person can drink half as much as a 200-pound person and have just as high a blood alcohol level, which is to say the lighter person becomes intoxicated more easily.

OK, how much can I drink and not be in danger?

To count actual drinks, let's define a drink as:

1.5 ounces of 86-proof whiskey,
or 12 ounces of beer,
or 5 ounces of wine.

To reach a blood alcohol level of 0.1% (and be in legal and physical **danger**), a person need only drink the following in one hour:

100-POUND PERSON	200-POUND PERSON
3 drinks	6 drinks

Remember that the body eliminates blood alcohol slowly. Even if, in the second hour, you slow down to a third of your first-hour speed, your blood alcohol level will remain at the dangerous 0.1% level:

100-POUND PERSON	200-POUND PERSON
1 drink more	2 drinks more

In hour three, fewer drinks yet will keep the blood alcohol in the danger zone:

100-POUND PERSON	200-POUND PERSON
3/4 drink more	1 drink more

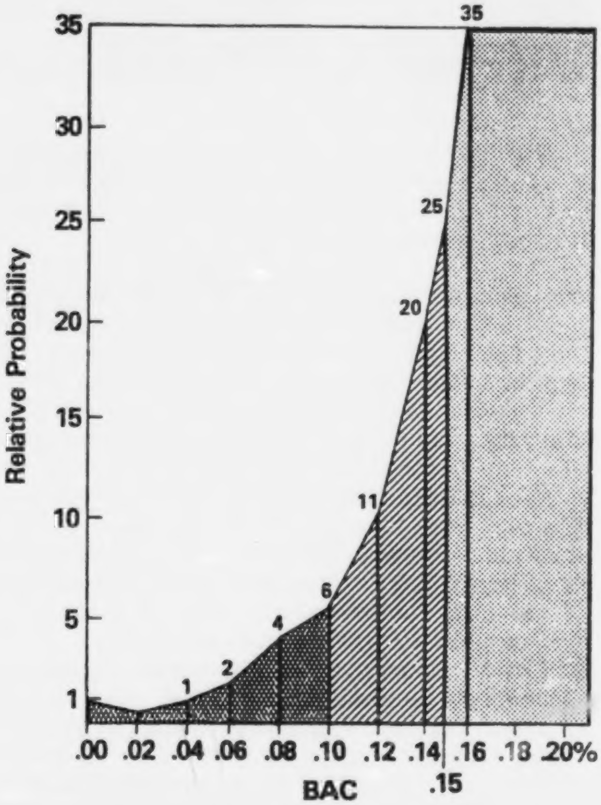
You may think you can "hold your liquor" and you may actually be better at it than some others, but don't think you are sober if you have been drinking.

0.15 - 0.30%	Confusion—disturbance of sensation. Decreased pain sense. Staggering gait, slurred speech.
0.25 - 0.40%	Stupor—marked decrease in response to stimuli. Muscular incoordination approaching paralysis. Complete unconsciousness probable at higher end of range.
0.35 - 0.50%	Coma—complete unconsciousness. Depressed reflexes. Subnormal temperature, anesthesia, impairment of circulation.
0.45% and above	Death can occur.

NOTE: Other factors can influence the effects of different blood alcohol concentrations.

The excessive use of alcohol is just as dangerous afloat as it is ashore. Impairment of one's faculties with too much alcohol can produce an extremely hazardous situation even within a relatively safe environment. Drunk boating can be as dangerous as drunk driving.

This depends on what you are doing. Anything that demands your full attention also demands that you not drink any alcohol. If you are off duty and want only to keep out of trouble, a blood alcohol level of 0.05% is a good maximum. Even this will get you arrested for driving while intoxicated in Sweden. In the State of Maryland, you can be arrested for driving with a blood alcohol level of 0.07%. It is called driving while "impaired." The following table shows the most an average person—in good health and with a full stomach, not on duty—should consider drinking (even here recognize that your chances of being involved in an automobile accident are 50 percent higher than a sober person's).



This chart, put together by the National Highway Traffic Safety Administration, shows that drivers with a blood alcohol level (BAC) of .15% are ***25 times*** *as likely to cause an accident as drivers with the a .00% BAC.*

100-POUND PERSON	200-POUND PERSON
First hour:	
2 drinks	4 drinks
Second hour:	
1 drink	2 drinks
Per hour after this:	
1/2 drink	1 drink

NOTE: Never, ever mix drugs (any kind of drugs, including cold pills and doctor's prescriptions) with alcohol. Each one can multiply the dangerous effects of the other, and together they can kill you.

(The figures above were taken from "STOP DWI: New York's Response to Drunk Driving," A Report to the Senate Special Task Force on Drunk Driving, February 1982)

Rescuing a Rescue Boat

The Orleans (Massachusetts) Historical Society has had a rescue mission afoot for three years. Its mission was given a significant boost recently when an agreement was reached between the Society and the Cape Cod National Seashore. The National Seashore agreed to transfer ownership of the "rescuee" to the Society.

The "rescuee" in this case is a gold-medal-winning rescue boat, a 36-foot motor lifeboat from the Chatham Coast Guard Station known only as CG 36500.

Thirty years ago, 32 crewmembers of the T-2 Oil Tanker PENDLETON, which had broken apart in waves cresting as high as 60 feet, leapt one by one from a jacob's ladder hung over the side into the bobbing CG 36500. All 32 were brought to shore safely. So daring was the rescue that the four crewmen, Boatswain's Mate Bernard Webber, Irving Maske, Andrew Fitzgerald, and Richard P. Livesey, were awarded the gold lifesaving medal for bravery by the Federal Government. This was the first time an entire boat crew had been so honored.

The 36500 made international headlines after the rescue. It then gradually slid into obscurity, ending up abandoned and forgotten, surrounded by brush and tree growth behind the maintenance building of the National Park headquarters in South Wellfleet.

Thanks to the rescue mission, the CG 36500 is now well on its way to becoming seaworthy again. The Orleans Historical Society is restoring the boat, built by the Coast Guard in Maryland in the 1940s, to its original condition. Fred Crowell, a Harwich, Massachusetts, crane operator, lifted the boat out of the bushes onto the boat trailer of the Nauset Marine Corporation of Orleans and transported it to property belonging to the Historical Society for restoration.

One of the rescuers' first duties was to check out the diesel engine. They found that a couple of minor items (the exhaust manifold, air intake silencer, and so on) needed to be replaced, but, overall, the block, pistons, crankshaft, etc. were in very good shape. The hull was checked by a marine expert and found to be surprisingly well preserved, save for the peeling paint. Now restoration of specific areas of the boat has begun. The tops of cabins, sides of the engine room hatch, and side decks are being fiberglassed with full cover from gunwale to gunwale, and certain parts are being repainted.

The 36500, with the 32 survivors from the PENDLETON, returns to Chatham fish pier to meet waiting reporters and photographers on that fateful night 30 years ago. Photo by Richard C. Kelsey

A projected date of completion for the mission is late May or early June of this year. The plan is to turn the CG 36500 into a floating museum. During the summer months, it will cruise in Cape Cod waters with on-board displays of its famous rescue (a large portfolio of photographs of the rescue is on file), giving visitors a chance to see a genuine fragment of Cape Cod's sea-oriented history.

The Orleans Historical Society has now launched a new campaign to build up an endowment fund. Its goal is to produce an income of about $2,000 a year for restoration, maintenance, crewing, and displaying of the famous old 36500. The fund has been named "Rescue 36500," and (tax-deductible) contributions are being accepted by the Orleans Historical Society, P.O. Box 353, Orleans, Massachusetts 02653.

Chemical of the Month

Toluene Diisocyanate: $CH_3C_6H_3(NCO)_2$

synonyms:	TDI toluene-2,4-diisocyanate meta-tolylene diisocyanate
Physical Properties	
boiling point:	251°C (484°F)
freezing point:	19 - 22°C (66 - 72°F)
vapor pressure at 20°C (68°F):	0.01 mm Hg (approx.)
Threshold Limit Values (TLV)*	
time weighted average:	0.02 ppm; 0.14 mg/m^3
short term exposure limit:	none established
Flammability Limits in Air	
lower flammability limit:	0.9% vol.
upper flammability limit:	9.5% vol.
Combustion Properties	
flash point (o.c):	132°C (270°F)
autoignition temperature:	277°C (531°F)
Densities	
liquid (water = 1.0):	1.2
vapor (air = 1.0):	6
Identifiers	
U.N. Number:	2078
CHRIS Code:	TDI
Cargo Compatibility Group**	12

Diisocyanates (dye-ICE-o-SIGH-uh-nates) first became commercially important when it was discovered that combining them with polyesters yielded polyurethane, a foam that acted much like foam rubber. Polyurethanes have, in fact, essentially replaced foam rubber nowadays. Different combinations of the ingredients produce different foams with different properties. During World War II, a rigid polyurethane foam was made and used in airplanes to cut down weight and provide structural strength. Today, this same type of foam is used extensively as an insulating material because of its excellent thermoinsulating properties. Flexible polyurethane foams find wide use in such things as cushioning in furniture and car seats.

In the process originally used, the foaming action for polyurethane foam was a result of the diisocyanate's reacting with water (which was added along with the polyester) to release carbon dioxide (more on this later). Over the years, simpler and less expensive methods have been developed to produce polyurethane.

The word "isocyanate" refers to a chemical group consisting of nitrogen, carbon, and oxygen and in which there is a double bond between the nitrogen and the carbon and a second double bond between the carbon and the oxygen. The group's usefulness derives from the relative instability and hence reactive nature of the double bonds. The first organic isocyanate compounds were prepared by Charles-Adolphe Wurtz, a noted French organic chemist, in 1849. It was shortly after World War II that these organic isocyanates gained industrial popularity in a new field of plastics where they were the main starting materials. Of these isocyanates, the diisocyanates ("di" meaning two), and the triisocyanates ("tri" meaning three) are some of the most useful and versatile.

Isocyanate groups attach to many types of chemicals. When attached to toluene (TOL-yoo-een), a common chemical used as a solvent in paints and oils and a component in airplane fuel, among other things, they produce a material with the properties needed for a certain type of plastics. Toluene diisocyanate (TDI) is perhaps the most important isocyanate. Those who load packages on ships may have seen

* The American Conference of Governmental Industrial Hygienists intends to reduce the time weighted average to 0.005 ppm/0.04 mg/m^3 and the short term exposure limit to 0.02 ppm; 0.15 mg/m^3.

** This number, found in Part 150 of Title 46 of the Code of Federal Regulations (formerly found in Navigation and Vessel Inspection Circular 4-75), tells shippers what bulk liquid cargoes can be safely carried adjacent to one another.

manufacturers' labels reading "2,4-TDI," "2,4-TDI (80%)/2,6-TDI (20%)," or "2,4-TDI (60%)/2,6-TDI (40%)." These denote the three general grades of TDI. The "2,4" and "2,6" are chemical shorthand used to refer to the attachment points of the isocyanate groups on the toluene.

TDI is a clear, colorless-to-pale-yellow liquid with a characteristic pungent odor. It is reactive with acids, bases (such as caustic soda, ammonia, or amines), and alcohols. It also reacts with water, as mentioned above, generating carbon dioxide. This is a slow reaction but an important one to prevent during shipping. The generation of the gas can lead to overpressurization of closed containers, such as drums. On board tank vessels this problem is avoided by requiring PV (pressure-vacuum) valves and a dry, inert atmosphere, such as a nitrogen blanket. Drums and tankcars and trucks are generally protected with a nitrogen blanket, as well.

TDI's aforementioned reactions with acids, bases, and alcohols can be violent and can generate heat. This can lead to an increase in the TDI vapors being generated. Overexposure to the vapors of TDI can result in watering of the eyes, damage to mucous membranes, and constricted breathing, similar to asthma. These effects may not be felt until several hours after exposure. In some individuals, a sensitization to TDI results from exposure. This results in increased severity of the effects felt by these people at subsequent exposures to even relatively minute amounts.

There may be no warning sign that TDI vapor is present. Although it is true that the chemical has a pungent odor, the "odor threshold," the minimum amount detectable by the human nose, is considerably higher than accepted exposure limits. If you can smell it, you are overexposed. In cases of inhalation exposure, remove the victim to fresh air. Give artificial respiration if necessary.

Contact with liquid TDI can result in serious eye irritation and transitory damage to the cornea. It also causes skin to turn a brownish color and can lead to the development of contact dermatitis. In cases of splashes or skin contact, remove contaminated clothing or shoes. Immediately flush the eyes, if affected, with running water for at least 15 minutes. If TDI is spilled on the skin, wash with rubbing alcohol followed by soap and water. Wash clothing and decontaminate shoes before using again.

In cases of ingestion (swallowing), do not induce vomiting. Have the victim, if conscious, drink large amounts of water to reduce the corrosive action of the ingested TDI.

In all cases of overexposure, seek medical attention immediately.

Protective equipment for workers handling TDI includes safety goggles or face shields, rubber or PVC gloves, coveralls, and fresh-air breathing apparatus.

Emergency protective equipment includes self-contained breathing apparatus, full-body water-proof suits, fitted long-sleeve rubber or PVC gloves and boots, and head protection.

The U.S. Coast Guard regulates toluene diisocyanate in Parts 151 and 153 of Subchapter O, Title 46, of the Code of Federal Regulations (CFR) and classifies it as a Cargo of Particular Hazard (COPH). The U.S. Department of Transportation, in Title 49 of the CFR, classifies TDI as a Poison B hazardous material. IMCO, the Inter-Governmental Maritime Consultative Organization, regulates TDI in its chemical code as a Chapter VI cargo and also classifies it as a Category B pollutant.

Space necessarily limits a more in-depth treatment of TDI. Those desiring more information and/or a more complete treatment of the handling of TDI are urged to contact the International Isocyanate Institute, Inc., 71 Elm Street, P.O. Box 1268, New Canaan, CT 06840, and request Brochure #1, "Technical Information—Recommendations for the Handling of Toluene Diisocyanate (TDI)."

Hazard Evaluation Branch
Cargo and Hazardous Materials Division

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. Fires of combustible metals (such as magnesium) are labeled Class

A. A.
B. B.
C. C.
D. D.

REFERENCE: MTAB Firefighting Manual

2. Which aid is NOT marked on a chart with a magenta circle?

A. Radar Station
B. Radar Beacon
C. Radio Direction Finding Station
D. Loran Station

REFERENCE: U.S. Chart No. 1

3. On stud-link anchor chain, it has been estimated that the addition of the stud increases the strength of the link by

A. 10 percent.
B. 20 percent.
C. 33 percent.
D. 50 percent.

REFERENCE: A.M.S.M.

4. The valve on the discharge side of a cargo pump on a tank vessel will usually be a

A. gate valve.
B. butterfly valve.
C. globe valve.
D. globe check valve.

REFERENCE: Marton, TANKER OPERATIONS

5. You are in charge of a power-driven vessel at night, and you sight the red, green, and white light of another vessel right ahead. You should

A. alter course to port and sound one short blast.
B. stop the engines.
C. reverse the engines and sound three short blasts.
D. alter course to starboard and sound one short blast.

REFERENCE: CG-169, RULES OF THE ROAD

ENGINEER

1. The quantity of heat that is required to raise the temperature of one pound of material 1°F is called

A. specific heat.
B. adiabatic efficiency.
C. latent heat.
D. sensible heat.

REFERENCE: P.N.E. NAVPERS

2. Which condition could cause cylinder relief valves on a large diesel engine to lift?

A. Plugged injector nozzles
B. Excessive fuel injection
C. Very late fuel injection
D. Incorrect crankshaft clearances

REFERENCE: Eng. 3&2 NAVPERS

3. To minimize the formation of carbon deposits on fuel injection nozzles, you should

A. avoid using liquid-cooled nozzles whenever possible.
B. avoid low cooling-water temperatures.
C. avoid prolonged overloading of the engine.
D. make certain the gasket seal between the nozzle and cylinder head is tight.

REFERENCE: Stinson

4. A centrifuge can be used to remove which contaminant from lube oil?

A. Kerosene
B. Soluble acids
C. Carbon particles
D. Antioxidant additives

REFERENCE: Osbourne 1

5. Early fuel injection is indicated by which set of conditions?

A. Loss of engine power and high exhaust temperature
B. Higher than normal firing pressure and low exhaust temperature
C. High fuel consumption and high exhaust temperature
D. Lower than normal compression pressure and high exhaust temperature

REFERENCE: Maleev

ANSWERS

DECK
1.D;2.D;3.B;4.D;5.D
ENGINEER
1.A;2.B;3.C;4.C;5.B

Question No. 1, DECK section, of the March issue's Nautical Queries is no longer valid, since the markings on the buoys used in traffic separation schemes now consist of horizontal orange and white bands.

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of the Marine Safety Council

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The SS POET disappeared in October 1980, leaving no traces. Since a conventional investigation was impossible, the Coast Guard turned to its Merchant Marine Technical Division to aid it in reconstructing the hypothetical chain of events which may have led to the vessel's disappearance. "SS POET: Lost at Sea, A Case Study in Vessel Casualty Analysis," beginning on page 177, highlights the services provided by this Division.

Coast Guard Roles and Missions Study Completed

On March 31, 1982, Secretary of Transportation Drew Lewis sent to Congress a 195-page report examining Coast Guard responsibilities in 14 areas ranging from search and rescue to law enforcement. This was the first such thorough review in 20 years.

"Our basic conclusion," Secretary Lewis said, "is that the Coast Guard should continue to carry out its traditional responsibilities—particularly wherever safety is concerned. It should continue, for example, as the U.S. maritime search and rescue coordinator and as the primary Federal maritime law enforcement agency. It should continue to establish construction standards for recreational boats and related equipment and to utilize the Auxiliary to promote boating safety. However, in each area there are recommendations for ways the jobs can be done more efficiently, more effectively, or at less cost to the taxpayer."

He added that some Coast Guard responsibilities had increased dramatically in recent years. Search and rescue activities, for example, have doubled in the past 30 years, largely as a result of the growth in recreational boating.

Extension of the fishing zone to 200 miles and the increase in drug interdiction responsibilities also added greatly to the Coast Guard's responsibilities in the 1970s. During the same period, Coast Guard activities in port and environmental safety increased significantly.

At the same time, Secretary Lewis noted, technological advances have enabled the Coast Guard to streamline operations in some areas, such as lightships and aids to navigation.

"The net result, however, has been increased demand on Coast Guard resources," Lewis said. "The Roles and Missions Study serves as the beginning in a planning process to provide overall strategies and direction for the next 20 years."

The report assesses the changes that have occurred in the Coast Guard over the past two decades, suggests functions which should be retained by the Coast Guard and those which could be shared with others or transferred, and addresses the Coast Guard's role for the period 1984 - 2000.

In addition to its recommendations on search and rescue and law enforcement, the report suggests that the states assume a larger role in recreational boating safety, that the potential for private-sector contracting of aids to navigation services be explored, that the Coast Guard and the Maritime Administration work more closely together in areas such as training and licensing merchant marine personnel, that the Coast Guard Auxiliary be used to greater purpose, and that user fees be adopted to recover the costs of various vessel safety functions, waterways management, aids to navigation, routine icebreaking operations, and other Coast Guard-provided services.

The report, which represents a year-long effort, was produced by an interagency group representing the Office of the Secretary of Transportation, the Office of Management and Budget, the Department of Defense, and the U.S. Coast Guard. Copies can be obtained from the Department of Transportation, Office of Public Affairs, S-80, 400 7th Street SW, Washington, DC 20590.

User Guide for Satellite Data Published

The *tracking* of environmental satellites is a fairly routine operation today.

Tracking down data available from these spacecraft, however, once required months of searching. The University of Rhode Island (URI), through its Sea Grant Program, has published a user's guide to environmental satellite data designed to make application of the data routine.

Environmental satellites measure a variety of characteristics. These include color (reflected solar radiation), temperature (emitted terrestrial radiation), surface roughness, and atmospheric content of water vapor and carbon dioxide.

Dr. Peter Cornillon, the URI oceanographer who wrote the guide, first became interested in the use of remotely sensed data from space for oceanographic studies in 1977. He looked for a user's guide which could acquaint him with the terminology of remote sensing and the information which was being collected. "I was shocked to find there was no single source, and so I began to gather the materials which have gone into this guide," Cornilon explained.

The guide begins with an introduction which tells what agencies distribute information from 14 environmental satellites. For those unfamiliar with remote sensing techniques, the various sensors which these satellites carry and what types of information they produce are covered. The heart of the guide is an overview of the characteristics and objectives of each satellite and the characteristics of the data which are available.

"A Guide to Environmental Satellite Data" has been published in a looseleaf format to allow users to easily update it, since changes in this area are rapid. It can be ordered for $20 from the Publications Unit, University of Rhode Island Marine Advisory Service, Narragansett, RI 02882. Checks should be made payable to the university, and P 894 should be specified. A pamphlet explaining other URI publications on remote sensing is also available.

Report on Maneuvering Standards Available

The Coast Guard's Office of Merchant Marine Safety recently released "Technical Basis for Maneuvering Performance Standards," a report prepared in connection with the notice of proposed rulemaking "Maneuvering Performance Standards for U.S. Flag Vessels" (CGD 80-136). *(See the Federal Register of September 14, 1981)*

The standards being developed are designed to provide a means for rating controllability under restricted water conditions where collisions, rammings, and groundings are likely to occur. The standards will apply to commercial oceangoing and Great Lakes vessels over 1,000 metric tons intended for the normal transport of cargo or passengers.

The Coast Guard contracted the firm Hydronautics, Inc., of Laurel, Maryland, to:

1. collect and analyze a large enough body of ship trials data to determine statistics of maneuvering performance and rate the performance of individual ships,
2. conduct maneuvering simulations on ships for which maneuvering qualities were known to determine behavior in standard maneuvers,
3. determine the effect of wind on ship controllability,
4. consider the effect of machinery on controllability,
5. determine whether a correlation between frequency of casualties and maneuvering performance could be established, and
6. establish proposed maneuvering performance standards.

Five levels of performance—superior, above average, average, below average, and marginal—were established based on full-scale trial data on over 600 vessels (tank vessels, cargo and container ships, and bulk carriers).

The proposed standards are based on ships' ratings in each of the following maneuvering trials:

- turning maneuver from full maneuvering speed with maximum rudder angle,
- 20-20 zigzag maneuver from full maneuvering speed,
- stopping maneuver from reduced maneuvering speed, and
- demonstrated ability to operate at a continuous speed between four and six knots.

The report (No. CG-M-8-81) is available to the public through the National Technical Information Service, Springfield, VA 22161.

Oil Spills in Ice-laden Waters Studied

To a large extent, the Coast Guard's environmental response capability has been tailored to incidents occurring in and along the coastal waters of the continental U.S. In recent years, however, the U.S. petroleum industry has expanded its area of interest to include onshore and offshore drilling along the coast of Alaska. With this drilling activity and the subsequent transport of the extracted petroleum has come the potential for environmental incidents.

To prepare for effective Coast Guard response in arctic and subarctic regions, such as arctic and subarctic Alaska (but also including the northern states in winter), the Coast Guard Research and Development Program has been studying the behavior of oil spilled in a broken ice field and defining appropriate spill response methods.

Recently, tests were conducted in a laboratory using a facility called an Ice Flume. This is an insulated glass-walled reservoir which holds oil, liquid water, and ice pieces and creates a flow of all three at pre-selected speeds. To create additional realism, a wind tunnel was built to direct a wind over the surface.

The spreading of oil caused by movement of the ice was investigated. The effects of current and winds, temperature, and other factors were noted.

A report summarizing these tests is now available. It presents information for determining the spread rate of oil spilled in a broken ice field. The results are mostly applicable to flow in one dimension, such as that encountered in a ship channel or a natural lead (i.e., a channel formed by solid ice). Various aids are recommended for use in oil spill response planning or for use by on-site response personnel in predicting the behavior of oil spilled in broken ice fields.

Copies of the report, "Laboratory Studies of Oil Spill Behavior in Broken Ice Fields," may be obtained from Commandant (G-DMT-4), U.S. Coast Guard, Washington, DC 20593.

Keynotes

The following items of general interest were published between March 22, 1982, and April 19,1982:

Final rules: CGD 12-82-MP1 Safety of Life on Navigable Waters, April 1, 1982. CGD 80-094 Safety Zone; Snake Island, Texas City, Texas; Mooring and Fleeting of Vessels, April 1, 1982. CGD 81-088 Great Lakes Pilotage Rules, April 1, 1982. CGD 81-099 Drawbridge Operation Regulations; Corte Madera Creek, California, April 8, 1982. CGD 17-82-01 Safety Zone; Fritz Cove, Juneau, Alaska, April 15, 1982. CGD 13-82-01 Seattle Opening Day Yacht Parade, April 15, 1982.

Notices of proposed rulemaking (NPRMs): CGD 7-82-05 Drawbridge Operation Regulations; Hillsboro River, Broward County, Florida, March 25, 1982. CGD 01-82-01 Drawbridge Operation Regulations; West Bay, Osterville, Massachusetts, April 1, 1982. CGD 8-82-01 Drawbridge Operation Regulations; Gulf Intracoastal Waterway, Algiers Alternate Route, Algiers, Louisiana, April 8, 1982. CGD 13-82-02 Regatta Regulations; Seattle Seafair Sea-Balley Trophy Race, April 8, 1982. CGD 07-82-08 Drawbridge Operation Regulations; Sarasota Pass, Gulf Intracoastal Waterway, Manatee County, Florida, April 15, 1982.

Advance notice of proposed rulemaking (ANPRM): CGD 8-82-09 Anchorage Regulations; Mississippi River below Baton Rouge, Louisiana, April 8, 1982.

Notices: CGD 82-035 Memorandum of Understanding between U.S. Coast Guard and American Bureau of Shipping Regarding Coast Guard Acceptance of Certificates of Admeasurement Issued by American Bureau of Shipping, April 1, 1982. CGD 82-041 Public Meeting; Chemical Transportation Advisory Committee (meeting to be held May 12, 1982), April 8, 1982. CGD 80-136 Maneuvering Performance Standards for U.S. Flag Vessels, Extension of Comment Period, April 8, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Standards Proposed for Fixed Fire Extinguishing Systems on Uninspected Vessels (CGD 74-284)

The Coast Guard recently issued an NPRM regarding equipment standards and approval of fixed fire extinguishing systems intended for use on uninspected vessels.

At present, most fixed fire extinguishing systems on uninspected vessels are complex installations that meet the requirements for large passenger vessels and are not suited for use on uninspected vessels. The costs of these systems can be prohibitive for recreational boats.

The Coast Guard has approved small fixed fire extinguishing systems in the past but has not published approval requirements. Vessel manufacturers, dealers, extinguisher manufacturers, and members of the boating public have requested that standards for approval of affordable fixed systems be developed.

The proposed standards contain essential design and performance requirements, approval tests, and procedures for approving fixed fire extinguishing systems on uninspected vessels. For further information on this NPRM, published April 19, 1982, contact Mr. Klaus Wahle, U.S. Coast Guard (G-MMT-3/12), Washington, D.C. 20593; (202) 426-1444.

Updated Electrical Engineering Regulations Published
(CGD 74-125A)

On April 8, 1982, the Coast Guard published its update of Subchapter J of Title 46 of the Code of Federal Regulations, the Electrical Engineering Regulations. This entirely new Subchapter J clarifies the regulations, brings them up to date, and deletes unnecessary requirements. Further, the revisions incorporate recommendations for electrical installations made by the International Maritime Organization (the newly renamed Inter-Governmental Maritime Consultative Organization) and the National Transportation Safety Board. Comments received from the public were considered in the final drafting of the regulations.

For further information concerning these final rules, contact LCDR Roger Mowery, U.S. Coast Guard (G-MMT-2/12), Washington, DC 20593; (202) 426-2206.

Accident Investigation Rule Withdrawn
(CGD 77-018)

The Coast Guard has withdrawn CGD 77-018, which was published in the Federal Register on January 25, 1979. That notice sought to implement Coast Guard authority to investigate accidents outlined in the Ports and Waterways Safety Act (PWSA). The rulemaking would have covered any incident or accident involving any structure subject to the PWSA or which affected or might have affected the safety or environmental quality of the ports, harbors, or navigable waters of the U.S.

The majority of comments received were negative. Most of the people commenting questioned the granting of authority to conduct investigations and the unclear extent of jurisdiction. The Coast Guard thus reevaluated its position and withdrew the NPRM.

For further information, contact LCDR Gary Gregory, U.S. Coast Guard (G-WPE-3), Washington, DC 20593; (202) 426-1934.

Amendments on Tank Stop Valves Withdrawn
(CGD 79-159)

The Coast Guard was considering amending its regulations on tank stop and other valves, as well as gates performing similar functions, on all inspected vessel except small passenger vessels. The purpose was to increase the safety of personnel and better protect the environment. An ANPRM was published in the Federal Register on April 16, 1981. All comments received were against the proposed amendments, and all commenters cited the economic impact of the proposed changes. The Coast Guard has decided that the improvement in personnel safety and environmental protection does not outweigh the anticipated costs. The rulemaking is thus being withdrawn.

For further information, contact LCDR Roger Mowery, U.S. Coast Guard (G-MMT-2/12), Washington, DC 20593; (202) 426-2206.

Rules on Certificates of Alternative Compliance Published
(CGD 80-157, CGD 77-136)

If a ship cannot fully comply with the technical light and sound requirements of the 72 COLREGS or the new Inland Navigation Rules, that vessel can be issued a Certificate of Alternative Compliance. Certification can be made only if the vessel is complying with the applicable rules as closely as possible while still maintaining its special functions. The majority of Certificates of Alternative Compliance are issued to offshore supply vessels used in the gas and oil industry. A small number are issued to very specialized, unusual vessels.

On April 1, 1982, the Coast Guard published two final rules concerning Certificates of Alternative Compliance. CGD 80-157 spelled out the requirements and procedures for obtaining a Certificate of Alternative Compliance under the new Inland Navigation Rules. CGD 77-136 amends the application procedures for obtaining a Certificate under the 72 COLREGS and covers who may apply, what information is required on the application, and how records are to be maintained. It also changes procedures regarding the termination of a certificate. In addition, several editorial and procedural changes have been made. As a result, the application and administration procedures for Certificates of Alternative Compliance are now faster and more efficient.

For further information regarding these final rules, contact LCDR Kent Kirkpatrick, U.S. Coast Guard (G-NSR-3), Washington, DC 20593; (202) 245-0108.

Annex V to Inland Navigation Rules Published (CGD 80-158)

Annex V, the rules on special application of navigation lights drafted under the authority of the Inland Navigational Rules Act, was published on April 15, 1982. The rules are not new but have been rewritten to make them easier to understand. These rules concern lighting for law enforcement vessels, dredge pipelines, and barges at bank or at dock. Annex V became effective on May 14, 1982, on all inland waters of the U.S. except the Great Lakes, where it will go into effect on March 1, 1983.

For further information on these regulations, contact LCDR Kent Kirkpatrick at the address in the preceding Keynote.

Final Action Taken on Annex IV to Inland Rules (CGD 81-007)

On April 15, 1982, the Coast Guard published a final rule enacting into law Annex IV of the Inland Navigation Rules. This annex concerns Distress Signals. The list of designated signals is the same as that in the International Rules, except that a strobe light signal has been added. A high-intensity light which flashes 50 to 70 times per minute will be recognized as a distress signal on United States inland waters. The addition of the strobe light signal in U.S. regulations comes as a result of public requests for this signal and also because a strobe light is a very effective means of attracting attention.

The other signals, such as a gun fired at a one-minute interval or an orange smoke signal, remain as described in Annex IV to the 72 COLREGS.

The regulations went into effect on May 17, 1982, on all U.S. inland waters except the Great Lakes, where they will go into effect March 1, 1983.

For further information, contact LCDR Kent Kirkpatrick (same address as two preceding Keynotes).

PFD Revisions Proposed (CGD 81-023)

The Coast Guard has proposed that obsolete provisions of its regulations on Personal Flotation Devices (PFDs) on recreational boats be revoked and corresponding editorial changes made. The changes will also clarify PFD carriage requirements (including those for Type V PFDs). The pamphlet which PFD manufacturers currently are required to provide for each PFD that is offered for sale has been revised, and it no longer need be in pamphlet form. Manufacturers may use the current pamphlet until their supplies are exhausted.

For further information concerning this NPRM, published April 12, 1982, contact Mr. William Sobeck, U.S. Coast Guard (G-BEL-3/43), Washington, DC; (202) 426-4176.

Study Done on Electrical Hazard Protection (CGD 81-050)

When a vessel is moored to a pier, an electrical potential, primarily in the form of stray currents, may build up between the vessel and the pier. If they are bridged by a good electrical conductor, such as the cargo transfer lines, particularly when the hose is being connected or disconnected, sparks may result. If this should occur on a tank vessel, which frequently generates explosive atmospheres, a fire or explosion may result. This may have caused several tank vessel casualties.

One widely used method of reducing the hazard is to connect a bonding wire between the vessel and the pier in an attempt to short-circuit the voltage and reduce the danger of stray currents. Many authorities believe this strategy to be very ineffective. A second method gaining favor in the petroleum industry calls for totally insulating the vessel from the shore, providing no path for a stray current to pass.

The Coast Guard recognized the need for further study on this phenomenon and on August 8, 1981, announced in the Federal Register the completion of a preliminary study done by the Jet Propulsion Laboratory (JPL) in Pasadena, California. Industry comments and participation were invited. The response by industry to this request was good. The need to explore new methods of protection from stray currents is clear. One industry representative commented that he hoped the Coast Guard study would settle the argument over bonding cables.

Although further study is needed, the Coast Guard, because of budgeting priorities, cannot continue to fund research. On April 15, 1982, the Coast Guard published a notice in the Federal Register suggesting that the study could continue if industry would provide the funding. This type of arrangement has been used before in Coast Guard research and development work. If the industry accepts this idea, the Coast Guard will remain project manager.

For further information, contact LT Robert Murray, U.S. Coast Guard (G-MVI-2/26), Washington DC 20593; (202) 426-2183.

Boundaries of COTP and MIO Zones Realigned (CGD 82-019)

On April 1, 1982, the Coast Guard published a final rule modifying several Captain of the Port (COTP) and Marine Inspection zones in the Third, Ninth, Twelfth, and Fourteenth Coast Guard Districts. These are organizational changes only and will not substantively alter the existing requirements and responsibilities of the public or the Coast Guard. The changes should result in a cost savings and more efficient use of available resources. An amendment document concerning the Albany and Guam Marine Inspection Offices (MIOs) was published April 26, 1982.

For further information, contact LCDR Bennet C. Osborne, U.S. Coast Guard (G-WPE), Washington, DC 20593; (202) 426-1450 or LT Wayne R. Hamilton, U.S. Coast Guard (G-MP), Washington, DC 20593; (202) 426-1483.

Effective Date for Inland Rules on Great Lakes Changed (CGD 82-037)

The new Inland Navigation Rules were enacted on December 24, 1980, and went into effect one year later on all U.S. inland waters except the Great Lakes. The effective date for the Great Lakes was delayed to allow the Canadian government time to establish parallel navigation rules. The Canadian and U.S. Coast Guards originally planned to have the new rules go into effect on the Great Lakes on April 1, 1982. Unexpected delays pushed the date back to July 1, 1982 *(see the Keynotes section of the April 1982 issue of the* Proceedings). Mariners on the Great Lakes have since then expressed their concern over changing the rules in the middle of the navigation season. The Canadian and U.S. Coast Guards have therefore agreed that the Inland Navigation Rules will not go into effect on the Great Lakes until March 1, 1983.

For further information, contact LCDR Kent Kirkpatrick, U.S. Coast Guard (G-NSR-3), Washington, DC 20593; (202) 245-0108.

Actions of the Marine Safety Council

April Meeting

The Council discussed two items of general interest at the April meeting.

CGD 82-030 Rewrite of 33 CFR 157 (Work Plan)

The regulations in Part 157 of Title 33 of the Code of Federal Regulations (33 CFR 157) were first issued in 1975 to implement the tanker standards in the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73). Since then, there have been several revisions and additions to 33 CFR 157, including those initiated to incorporate the requirements written into the 1978 MARPOL Protocol which modified and incorporated MARPOL 73. (The composite Convention is known as MARPOL 73/78.) Most of the regulatory changes were undertaken within a short period of time and had rigid completion dates. In addition, many interpretations of internationally agreed upon standards were completed after the final regulations implementing these standards had been issued, resulting in the need for interpretive documents. These factors have produced a set of regulations that are complex, difficult to understand, ambiguous, inconsistent with international agreements, and, in some instances, in error. This rewrite is needed to provide a more clear, concise, and correct set of regulations and see that 33 CFR 157 is consistent with the latest international requirements and interpretations.

No changes in existing policy are involved. An NPRM is expected late this fall.

CGD 82-034 Amendments to 46 CFR 157 (Work Plan)

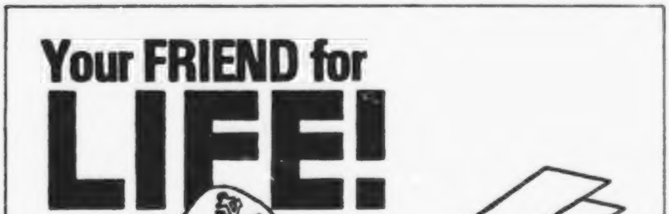
The thrust of this project is to revise joint regulations of the U.S. Coast Guard and the National Transportation Safety Board. The NTSB will have an increased role in investigating accidents involving Coast Guard vessels or in which Coast Guard safety functions are directly involved. This will minimize any appearance of conflict of interest that might otherwise arise from accidents in which the Coast Guard would be investigating itself.

A rule is expected late this summer. ⚓

National
Safe Boating Week
June 6-12, 1982

Wear Your PFD (Your "Friend for Life")

The boating season is a time when all of the organizations concerned with your well-being bombard you with safety advice. Unfortunately, because you get so many messages, you might not remember any single piece of advice very long. It's sort of a "can't see the forest for the trees," or vice versa, situation.



Boaters may realize that they should be careful while refueling, or that there are accepted procedures they should follow to pass another boat, or even that every boat is required to carry certain safety equipment. But what are the specifics? There's just so much information to remember.

The National Safe Boating Council, Inc. (NSBC), a group of private and public organizations concerned with improving safety on the water, and the U.S. Coast Guard recognize the frustration boaters may experience in trying to remember all of the safety advice bombarding them. The two groups studied boating accident statistics and found that there was one, simple, easy-to-remember safety message that, if heeded, would do more to save lives than all of the other pieces of advice put together. The message is:

"Wear your Personal Flotation Device."

"With this message, we have the potential to significantly reduce boating accident fatalities," says LCDR William Ladd of the Coast Guard's Boating Education Branch in Washington.

Ladd explains that boating data compiled by the Coast Guard show that 85 percent of all people who die in boating accidents drown. Most of them are not wearing a Personal Flotation Device (PFD).

"The logic is simple," says Ladd. "Get boaters to wear their life jackets whenever they boat, and you reduce the number of accidental drownings."

While the logic may be simple, Ladd concedes that convincing boaters of the need to always wear PFDs is a challenge.

"Granted, most people view PFDs as confining, uncomfortable, unglamorous. They interfere with a person's getting a tan. They're not 'macho.' It will be an uphill climb, but we are taking a step up just by letting people know about our '85 percent' statistic."

Ladd likens promoting the wearing of PFDs to safety campaigns geared to getting people to wear motorcycle helmets or seatbelts.

"What we have to do is make people aware of the dangers they face by not wearing a PFD. Then they will be able to weigh the benefits of wearing a PFD against the alleged inconvenience.

"And it is an 'alleged' inconvenience. With the number of styles, shapes, colors, and weights of PFDs available today, there's no reason why a person can't find one he would be comfortable wearing during a day on the water."

The Coast Guard and the NSBC will kick off the promotion of the "wear your PFD" theme during National Safe Boating Week 1982, to be observed June 6 -12.

"Our slogan is 'Wear your PFD, your Friend for Life,'" says George Rounds, Chairman of NSBC. "We will be promoting this slogan through posters, radio and television advertising, news releases, and any other means we can think of."

Rounds says NSBC relies on local boating groups to promote its National Safe Boating Week theme. These groups include yacht clubs, marina associations, flotillas of the Coast Guard Auxiliary and U.S. Power Squadron, local Coast Guard units, owners of marine equipment stores, and state boating law administrations.

"NSBC provides these groups with posters and 'how-to' manuals for promoting safety afloat," says Rounds. "From then on, it's up to them to get the message out to the boaters."

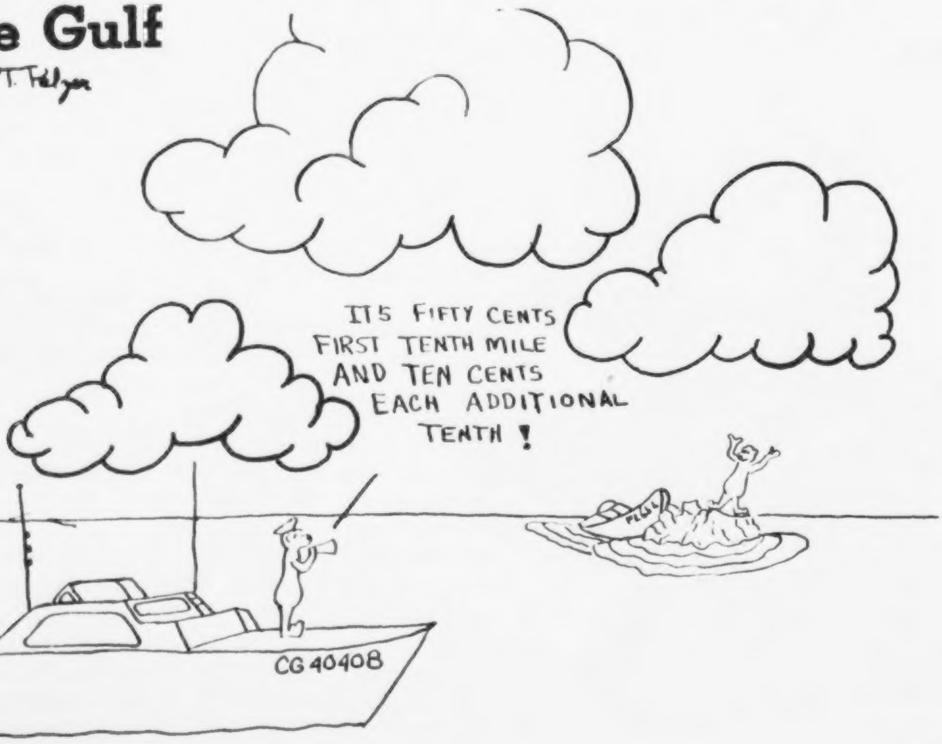
And apparently it works. The number of boaters who die each year per 100,000 boats (the boating death rate) is declining even as the number of recreational boats on the water continues to grow.

Rounds feels that promoting the wearing of PFDs will cause the rate to decrease even further.

"Ideally, we would like to see the wearing of a PFD become second nature to all boaters. You go aboard your boat, the first thing you do is put on your life jacket. People do it with seatbelts in cars. We hope we can condition boaters to do it with PFDs."

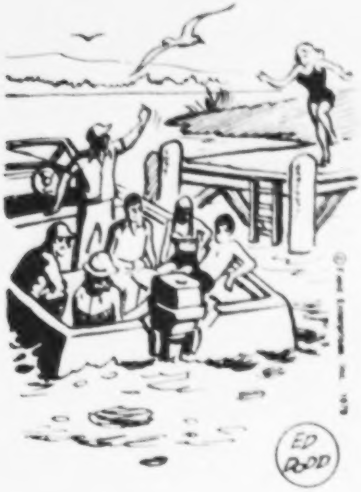
Charlie Gulf

by P.T. Felyn

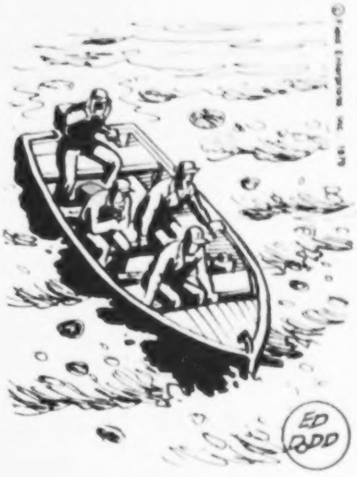

ITS FIFTY CENTS FIRST TENTH MILE AND TEN CENTS EACH ADDITIONAL TENTH !
CG 40408

Ten Little Boaters

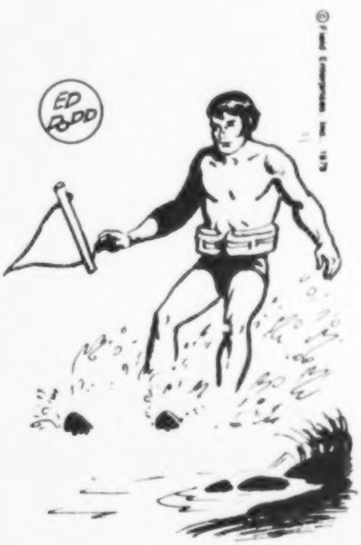
by Peggy Tjarks
U.S. Coast Guard Auxiliary
Second District



10 Little Boaters, Skimming o'er the Brine . . .
One Boat was Overloaded, and then there were 9.
(Seats do not indicate capacity . . . total weight, not numbers, is your only safety guide)
9 Little Boaters, Fishing until Late . . .
One Ignored the Weather, and then there were 8.
(In rough water, keep low in the boat and head it into the waves)
8 Little Boaters, Motors really "Revvin" . . .
One had too much Power, and then there were 7.
(Overpowered boats lead to disaster. Match the boat to the motor)
7 Little Boaters, Seeking Aqua Kicks . . .
One Brought a Bottle, and then there were 6.
(Boating and alcohol are a deadly mixture. Don't drink while boating)



6 Little Boaters, Dunked—But still Alive . . .
One Tried to Swim to Shore, and then there were 5.
(Capsized boats rarely sink. Stay with the boat until help arrives)
5 Little Boaters, Zooming Toward the Shore . . .
One "Buzzed" the Dock, and then there were 4.
(For safety's sake, give docks, swimmers, and other boats a wide berth, then reduce speed when approaching shore or congested waters)
4 Little Boaters, Towing Board and Ski . . .
One Steered Alone, and then there were 3.
(Water skiing and surfboarding are safe only when an alert observer accompanies the operator)



3 Little Boaters, Well Equipped it's True . . .
But One Forgot his Life Jacket, then there were 2.
(Provide PFDs for all occupants of a boat)
2 Little Boaters, Out for Fishing Fun . . .
One Stood to Land his Catch, and then there was 1.
(If you must move in a small boat, or change seats, keep low and in the center with both hands on the gunwales)
1 Little Boater, Who is Still Afloat Today . . .
By Following Sound Safety Rules, He Hopes to Stay that Way.
(Your life and the lives of others depend on your skill, care, and judgment in handling a boat)
REMEMBER—NO SAFETY DEVICE CAN REPLACE COURTESY, CAUTION, AND COMMON SENSE

New Device Makes Towing Safer and Easier

Two Coast Guardsmen in the Second District, Seaman Rodney Bupp and Petty Officer First Class John Treece, have put the finishing touches on an invention that has been under development at Station Marblehead, Ohio, for two boating seasons. Station members claim it has helped reduce accidents and makes towing operations easier.

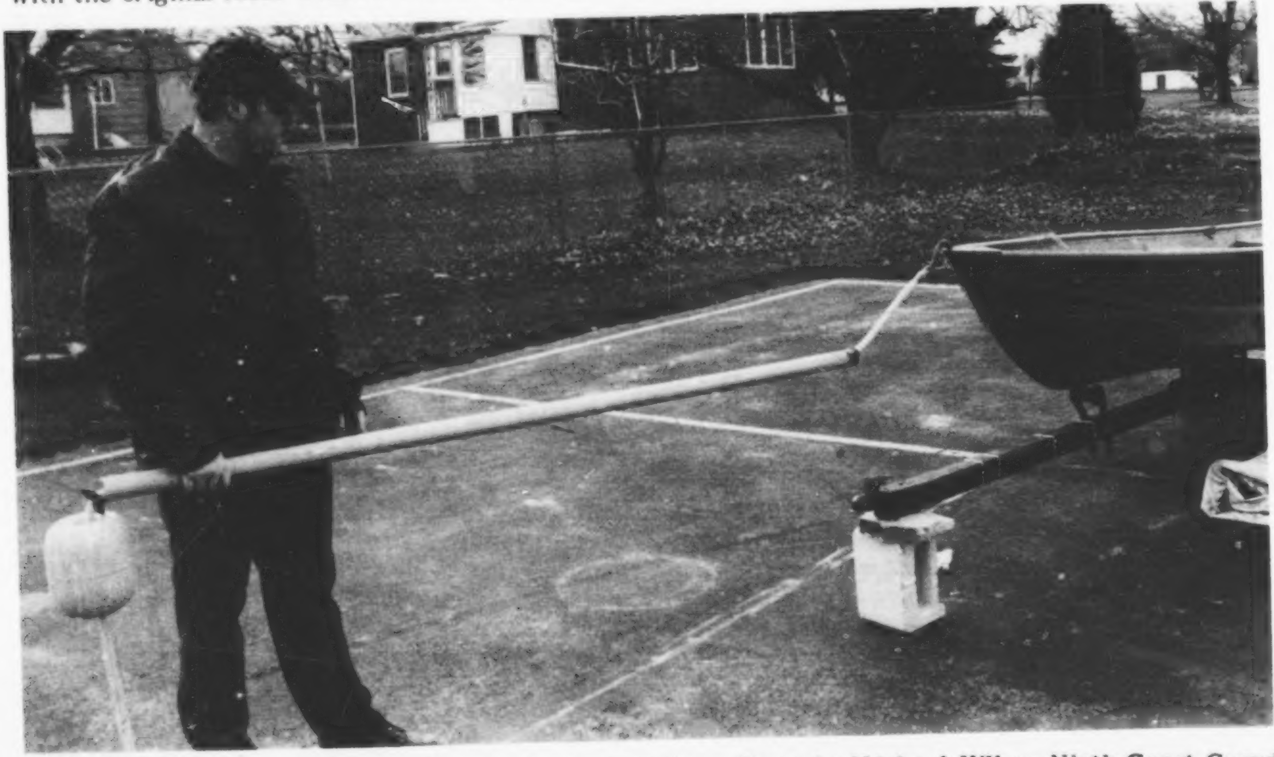
Since station personnel are transferred every so often, ideas sometimes just don't get off the ground. Luckily, this one was passed on to successors.

The device that has evolved over the past two summers is a hook-up device worked on to the bitter end of a towline. This eliminates the need to have the disabled boater tie the towline to the bow. In fact, with this device all the disabled boater has to do is keep the boat in line with the Coast Guard boat.

Petty Officer First Class Bill Pickett, stationed at Marblehead two years ago, came up with the original idea. Pickett fitted a piece of metal piping over the end of a towline with a J-hook attached to the bitter end. Since the pipe weighed too much, he switched to PVC piping. The end was heated and flared to fit perfectly around the J-hook while at the same time opening the safety clip. The pipe offers a clear reach from the stern of the towing vessel to the bow of the disabled craft. The boat crewman can then reach out and hook the bow. When he pulls back on the piping, the safety clip is released with the hook securely in place.

Last summer, Bupp and Treece added a float to keep the line from sinking. A piece of leather was sewn into place behind the pipe to keep the pipe from riding up and down during the actual tow.

After seeing the device in operation for two full summers, Treece said it had proved its worth in preventing accidents and has taken a lot of danger away from the towing operation itself. The supplies to make the device can be acquired at a local hardware store at a minimal cost. ⚓



Seaman Rodney Bupp demonstrates the hook-up device. Photo by Michael Hilley, Ninth Coast Guard District

How Hazardous is Harvesting the Sea?

A Report on Fishing Fatalities

by Rick Gleason

Fishermen have long been aware that they were engaged in a risky occupation. Few, however, have realized just how risky.

The following case histories, taken from the *Alaska Fishermen's Journal* (AFJ), provide only three examples of what is too often the fate of fishermen. Virtually all commercial fishing fatalities can be attributed to one of three causes: vessel sinkings (85 percent), falls overboard (10 percent), or accidents on board vessels (5 percent).

Vessel sinkings

A 95-foot fishing vessel went aground after taking on water during a storm in Bristol Bay, a large estuary north of the Aleutian Island chain, on August 20. Two crewmen died after abandoning the listing vessel. Five other crewmen survived. (AFJ - October 1981)

Falls overboard

A 34-year-old man was lost at sea May 8 when he reportedly fell overboard about three miles south of Tongue Point in Bristol Bay. A Coast Guard C-130 joined many vessels in the area to search for him without success. The man's brother had fallen overboard at the same time but had been rescued. (AFJ - June 1981)

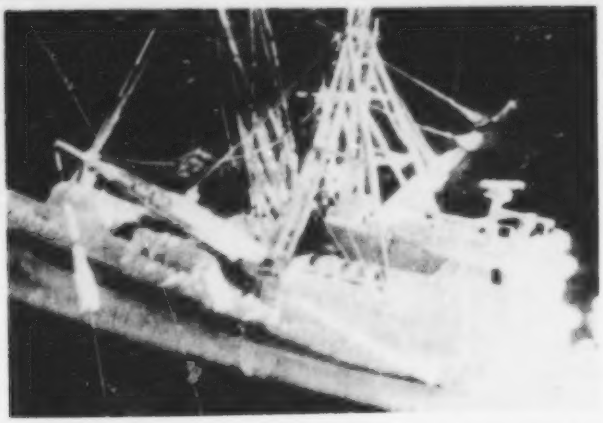
Accidents on board vessels

A 49-year-old man died May 8 after being struck on the head by a crane boom on a crab vessel. The blow from the crane reportedly knocked him overboard near Summit Island, Alaska. (AFJ - June 1981)

Vessel sinkings can result from a boat's icing up, groundings, collisions, overloading, flooding, improper storage, faulty navigation equipment, storms, marine fires, open lazarette, unattended autopilot, or someone's falling asleep at the wheel.

Fifty percent of the **falls overboard** studied

Rick Gleason is an industrial hygienist presently employed by the State of Washington in its Department of Labor and Industries (Division of Industrial Safety and Health). He previously spent three and a half years working as a safety and health inspector for the Occupational Safety and Health Administration. Mr. Gleason has also worked as a commercial fisherman in Washington and Alaska.



Icing is one cause of vessels sinkings, which account for 85 percent of commercial fishing fatalities. Coast Guard photo by Norm Holm

by the author (using Coast Guard records in the North Pacific) occurred when someone was urinating over the side of the boat and was unexpectedly swept over the railing. Falls overboard can also result from a railing that is not of sufficient height or strength, bad weather, carelessness, slippery decks, or horseplay, or while people are climbing to the flying bridge in heavy weather, loading and unloading from a dock higher or lower than the vessel, transferring from one vessel to another, attempting to dislodge items from the propeller, or operating the gear in a position that requires them to lean overboard.

The results of falls overboard are often serious. Life vests are rarely worn. The engine noise will drown out any shouts for help by the person in the water. Other crewmembers assume the absent deckhand is in the bathroom (engine room, hold, galley, etc.). Rubber boots may fill with water and drag the person down. Also, hypothermia can be deadly if a person is in the water for more than 30 minutes.

Accidents on board vessels can be traced to a number of hazards, such as unguarded machinery, open hatchways, the need to work at heights (on the mast or flying bridge), crewmembers' lack of training in the proper use of equipment, burns, fires, inadequate lighting, work stress or fatigue, the need to work in bad weather or at night, someone's rush to get a job done, inexperience on the part of some crewmembers, or improper maintenance of equipment.

In the United States, few statistics can be found on commercial fishing accident and death rates. Other countries, most notably Great Britain, have done some work in this area. In 1966, an article by a British doctor, R. S. F. Schilling, appeared in the *Proceedings of the Royal Society of Medicine*. Dr. Schilling wrote in his article, "Trawler Fishing, an Extreme Occupation," that the mortality rate of British trawl fishermen was reportedly twice that of miners and twenty times that of those employed in the manufacturing industry.

"How hazardous is commercial fishing compared to other occupations?"

Marine Safety Officer Dave Illuminati helped me answer that question by searching through Coast Guard records from 1978 through 1981 at the Seventeenth Coast Guard District Office in Ketchikan, Alaska. He reviewed all fatalities involving commercial fishermen in the state of Alaska. As separate files are not kept for fishermen, all files first had to be reviewed to determine whether the incident in question was commercial fishing-related. Fatalities involving crewmembers of sport fishing boats, recreational boats, sailboats, charter boats, tugboats, ferries, and barges were excluded.

The study encompassed fatal accidents only and did not include injuries to fishermen or their illnesses, as most of these do not get reported to the Coast Guard. (Likewise, fishermen are not covered by State Workers' Compensation Insurance and are not included in state statistics on injuries or illnesses. Injuries may be recorded if the fisherman is treated under the Alaska Fishermen's Fund Program.) We were able to determine the total number of commercial fishermen from Alaska records, since Alaska requires each commercial fisher-

A crewmember could easily fall through the ice covering an open hatchway.

Table I Commercial Fishing Fatality Rates for Alaska

Year	Number of Commercial Fishermen	Total Number of Deaths	Annual Death Rate per 10,000 Fishermen
1978	35,140	42	12.0
1979	40,800	31	7.5
1980	43,285	39	8.8
1981	42,966	34	8.0

man in the state to be licensed.

Table I shows the death rate for commercial fishermen in Alaska for the 4-year period.

The figures show the 4-year average for commercial fishermen in the state of Alaska to be approximately 9.0 deaths a year for every 10,000 workers. In order to put these statistics into perspective, it is necessary to compare these rates to those for other occupations in Alaska and across the country. The statistics shown in Table II for the United States were taken from the 1978 National Safety Council *Accident Facts*. Also included are rates taken from the *1978 Occupational Injury and Illness Statistics* published by the Alaska Department of Workers' Compensation.

Table II Industrial Fatality Rates in the U.S. and Alaska, 1978

Industry	Total Number of Workers	Total Number of Deaths	Annual Death Rate per 10,000 Workers
Firefighters (U.S.)	60,000	68	6.8
Mining (U.S.)	800,000	500	6.3
Manufacturing (Alaska)	11,450	7	6.1
Construction (Alaska)	12,240	7	5.7
Construction (U.S.)	4,600,000	2,600	5.7
Logging (Alaska)	1,840	1	5.4
Agriculture (U.S.)	3,500,000	1,500	5.4
All Industry (except fishing) (Alaska)	114,990	47	4.1
All Industry (except fishing) (U.S.)	94,800,000	13,000	1.4
Manufacturing (U.S.)	20,300,000	1,800	0.9

Up until now, it had been reported that firemen had the highest death rate of any occupational group in the United States. In 1978, however, Alaska commercial fishermen had a death rate 88 percent higher than that of firemen (12.0 compared to 6.8). *The 1978 fishing fatality rate is almost twice that of miners and 13 times that of people employed in the manufacturing industry.*

Commercial fishing in Alaska employed 35,140 people in 1978, while all of the state's other industries combined employed 114,990. *Even though fishing employed only 23 percent of the state's people, it accounted for 47 percent of the total occupational deaths* (42 commercial fishing deaths vs. 47 from all other industries combined). This rate is all the more startling in view of the fact that fishermen do not work year-round. Most have other jobs and work as fishermen during the summer salmon season or the winter king crab season.

Recommendations

In the author's opinion, it is the responsibility of the **U.S. Coast Guard** and **Congress** to help reduce this loss of life at sea by promulgating and enforcing safety and health standards which apply to fishing vessels. The standards should encompass certification and inspection of lifeboats, life rafts, and survival suits. The Coast Guard could adopt many standards now enforced by the Occupational Safety and Health Administration, such as those pertaining to machine guarding, working at heights, fire protection, noise, illumination, line and rope maintenance, ladder construction, welding, personal protective equipment, entry into confined spaces, commercial diving, and proper railing heights.

Pulling shrimp traps through the ice can be extremely dangerous. Safe work practices are a must.

It is the responsibility of the **skipper** of the fishing vessel to adequately train his workers in the following areas:

- Location of fire extinguishers and how to use them
- Location and use of survival suits and life jackets and periodic drills on donning them
- Location of and inflation procedure for the life raft and yearly maintenance by a Coast Guard-certified inspector
- Location of emergency flashlights and Emergency Position Indicating Radio Beacon (EPIRB) and proper upkeep of the batteries
- Proper gear operation and maintenance, stressing safety
- Proper personal protective equipment: gloves, headgear, safety glasses, non-slip footwear, and raingear that is not bulky and will not catch in machinery
- Location and contents of the first aid kit
- Location and operation of bilge pumps and manual emergency pumps and knowledge of how to contact the Coast Guard on the radio
- Proper operation of the stove and heater
- Location of hatch covers and cargo doors and awareness of the need to keep them closed when not using them.

It is also the skipper's responsibility to know the limitations of the crew and not push crewmembers beyond their ability. Fatigue can lead to an accident.

Finally, it is the responsibility of the **deckhand** to work safely at all times, possess a valid first aid card and have cardiopulmonary training, read and familiarize himself with the proper operation of the equipment, watch out for the safety of the other members of the crew, follow instructions, and use the bathroom instead of the railing! ⚓

SS Poet: Lost at Sea

A Case Study in Vessel Casualty Analysis

by LCDR Robert W. Henry
Ship Design Branch
Marine Technical and
Hazardous Materials Division

In October 1980 the U.S.-flag cargo vessel SS POET disappeared while en route to Port Said, Egypt, with a cargo of bulk corn. Its 34 crew members are missing and presumed dead. The following article does not intend to solve the mystery of the vessel's disappearance but rather to highlight some of the technical services used in analyzing the casualty. These services were provided by the Coast Guard's Merchant Marine Technical Division (now the Marine Technical and Hazardous Materials Division).

INTRODUCTION

The vessel involved in this casualty began its existence as the GENERAL OMAR BUNDY, a troopship constructed by Kaiser Shipbuilding Corporation in Richmond, California, in 1944. It was later converted for service as a cargo vessel and underwent several name changes before becoming the SS POET. Its last voyage, involving the carriage of 13,500 long tons of #2 yellow corn, was intended to be similar to its previous trips. The SS POET departed the Port of Philadelphia in the early morning of October 24, 1980, after receiving cargo, fuel, and fresh water. The vessel was declared overdue on November 3, and an extensive search followed. No trace of the vessel or its 34-man crew was found. On November 17 the Commandant of the Coast Guard established a Marine Board of Investigation to inquire into the disappearance.

Early testimony presented to the Marine Board did little to clarify the probable cause of the vessel's disappearance. However, the Board was able to construct a hypothetical chain of events based on, among other things, the results of analyses performed by the Coast Guard's Merchant Marine Technical Division.

HISTORY

The Merchant Marine Technical Division got its start back in the late 1930s in the old Bureau of Marine Inspection and Navigation (BMIN). The formation of a technical group within the Bureau was mandated by Congress after the loss of 124 lives in the MORRO CASTLE fire. During World War II the functions of the BMIN were transferred to the U.S. Coast Guard. After the War, the Office of Merchant Marine Safety was formed in the Coast Guard, and the technical expertise gained from the Bureau became the basis for the new Merchant Marine Technical Division (MMT). (The division was recently reorganized and became part of the Marine Technical and Hazardous Materials Division). Over the last 30 years, MMT assumed the following functions:

- Assessment of the safety of novel marine concepts

- Review of plans and specifications
- Stability approval
- Lifesaving equipment approval
- Firefighting and fire protection evaluation
- Marine safety regulation development
- Loadline and admeasurement review
- Technical support and assistance
- Technical guidance at IMO (formerly IMCO)
- Pollution prevention

One of MMT's traditional tasks was to assist in Coast Guard Marine Boards of Investigation. The following partial list covers recent major casualties where MMT lent its technical assistance:

CV SEAWITCH - June 2, 1973

MMT investigated the vessel to determine the extent of damage and to assess the performance of the installed safety features.

SS SILVER DOVE - April 2, 1973

MMT provided analysis and testimony on the vessel's loss of stability as a result of the flooding of a major cargo hold.

SS EDMUND FITZGERALD - November 10, 1975

MMT provided technical assistance concerning the vessel's lifesaving features, loadline, and stability.

Drilling Rig OCEAN EXPRESS - April 15, 1976

MMT conducted an analysis to evaluate the unit's stability while under tow and in transit. MMT also provided expert testimony on the design, testing, and approval of the lifesaving appliances.

MV CHESTER A. POLING - January 10, 1977

MMT conducted an analysis to evaluate the condition of the vessel's hull structure, its loading, and the prevailing weather and sea conditions. MMT monitored testing of the hull steel and hull welding.

MV ANGELINA LAURO - March 30, 1979

MMT did an on-site examination of the fire damage to the vessel and presented technical information on the ship's fire protection systems.

TECHNICAL ANALYSIS

The loss of the SS POET was not typical of most casualties previously analyzed by MMT in that no survivors or vessel debris was recovered to aid in the casualty analysis. On the basis of testimony, a review of the vessel's plan file, and information gathered from the crew of the SS PENNY, sistership of the SS POET, the Marine Board of Investigation provided specific instructions to MMT requesting that the strength of the vessel, intact and damage stability, and seakeeping characteristics be evaluated. Reconstruction of vessel loading conditions was the first task.

Vessel Loading

The "departure condition" of the SS POET was synthesized from the National Cargo Bureau, Inc. (NCB) grain stability calculations for the last cargo load, sample conditions from the vessel's Trim and Stability Booklet, and the last observed drafts. The intact condition of the SS POET at any time during its voyage could then be calculated on the basis of the estimated departure condition by making assumptions about expenditure of consumables (fuel and water) and vessel trim.

Computer Application

Taking the SS POET's assumed loading condition at the time of its disappearance as a starting point, MMT used its extensive computer analysis capability to further define the hydrostatic and hydrodynamic characteristics of the vessel. These computer resources were developed wholly or in part with Coast Guard funding to provide the means to answer technical questions related to maritime safety. Similar analytical tools exist elsewhere in the marine community, but the following programs have been tailored to suit particular Coast Guard needs:

SHCP	(**S**hip **H**ull **C**haracteristics **Pro**gram) - Provides data for still water and wave-induced bending moments and intact and damage stability information such as displacement, draft, trim, centers of buoyancy, gravity and flotation, and the location of the metacenter.
CGSCORES	(**C**oast **G**uard **S**hip **Co**mputer **Res**ponse) - Provides hydrostatic and hydrodynamic information concerning still water and wave-induced bending moments and shear forces, deck wetness, and slamming.
CAPSIZE	(Capsize) - Provides stability and synchronous rolling data for a ship in following seas.
GIFTS	(**G**raphics-oriented **I**nteractive **F**inite Element **T**ime-sharing **S**ystem) - Performs detailed structural analysis.
FLEXSM	(**Flex**ible **S**ection **M**odulus) - Provides strength analysis of a vessel's hull girder, taking into account buckling of plating.

Intact and Damage Stability

An NCB Grain Stability Calculation form was completed using the previously computed cargo and liquid loading calculations. Assumed shifts of grain were calculated according to SOLAS 1974, Chapter VI, to determine the list and dynamic stability of the SS POET in its departure condition at Philadelphia on October 24, 1980. The static angle of heel was determined to be 10.6°, and the available residual dynamic stability (righting energy) was 36.6 ft-deg up to an angle of heel of 40°. These values complied with SOLAS 1974 requirements.

The SS POET's intact stability was calculated using a long form loading sheet and the vessel's Trim and Stability Booklet. The SS POET's metacentric height, a measure of initial stability relating to the ability of a vessel to resist heel from the upright position, was found to be within Coast Guard standards.

The SS POET was also evaluated for damage stability. Both Hold No. 1 and the after machinery space were alternately "flooded" and evaluated under various conditions using the computer program SHCP. The resulting stability characteristics showed the vessel to have positive stability after damage.

Longitudinal Strength

FLEXSM was used to evaluate the longitudinal and collapse (buckling) strength of the SS POET on the basis of its hull girder. CGSCORES was run to provide shear forces, bending moments, and stresses for specific loading conditions. The computed longitudinal strength of the vessel was found to be acceptable when compared to Coast Guard structural standards.

Seakeeping

CGSCORES was also run to evaluate the seakeeping characteristics of the SS POET. CGSCORES, using the vessel's hull geometry and weight distribution, computes the motions of a vessel and the loads on it caused by wave action. The deck wetness analysis indicated that at speeds of 5 and 8 knots in 22.5-foot seas, water on deck would occur more often in stern quartering seas than in bow seas. In the even keel condition, water on deck would occur from about 20 times per hour for head seas to about 50 times per hour for stern quartering seas. The No. 1 hatch coaming was 5 feet above the deck. This location would become immersed less than once per hour in bow seas and more than 10 times per hour in stern quartering seas.

The computer program CAPSIZE was run to evaluate the rolling response of the SS POET to following seas under various conditions. In the computer program, a "capsize" is arbitrarily defined as a roll in excess of 115°. The CAPSIZE simulations did not indicate capsizing for any of the assumed conditions. CAPSIZE results do not take into account any shifting of cargo. The program also does not take into account actions that a prudent seaman might take in response to severe vessel motions. A small helm change could produce a markedly different vessel response.

The studies described above summarize the services provided by the Merchant Marine Technical Division. MMT's objective was not to draw conclusions but to assist the Marine Board in its efforts to find the most probable cause for the loss of the SS POET. The questions involving stability, seakeeping, and strength required full use of Coast Guard analytical capabilities. The report to the Board will be published as technical report CG-M-4-81. Copies may be obtained by contacting Commandant (G-MTH-4/13) at Coast Guard Headquarters ((202) 426-2197) or through the National Technical Information Service (NTIS), Springfield, VA 22161.

Marine Casualty Report Released

SS POET: DISAPPEARANCE
Report No. USCG 16732/11486

Signed by the Commandant
of the U.S. Coast Guard on April 12, 1982

This report on the SS POET contains the U.S. Coast Guard Marine Board of Investigation report, action taken by the Commandant to determine the proximate cause of the casualty, and recommendations to prevent recurrence.

The Commandant has concurred with the Marine Board that the proximate cause of the casualty cannot be determined. Although the Board found that a credible case could be made for a number of possible causes, the Commandant considers it more probable that some loss of hull integrity occurred. If a loss of hull integrity occurred, the ingress of water could have gone undetected by the crew long enough to lead to the sudden loss of the ship by plunging, capsizing, or foundering.

This document is available to the public through the National Technical Information Service, Springfield, VA 22161, or from Commandant (G-MMI-1/24), U.S. Coast Guard, Washington, DC 20593; (202) 426-1455. ‡

The Rhyme and Reason of Coast Guard Mailing Addresses

Readers who write to the Coast Guard are familiar with such symbols as G-CMC, G-WER, and G-MMI.

If you've been wondering what these letters stand for, this article is for you.

The "G-" that you see in front of these staff symbols is a requirement of the Office of the Secretary of Transportation. Each administration has a letter prefix for its staff symbols, and the Coast Guard uses "G."

The first letter after the hyphen designates an Office. The Coast Guard is divided into 16 of these. The older offices have letters that are the first letter of their title. For example, P is Personnel, O is Operations, M is Merchant Marine Safety. As duplicate first letters began to crop up, the Coast Guard had to look for alternatives. Comptroller, for instance, couldn't use C because the Office of the Commandant used it. So the Comptroller uses F (for the Financial work it does). Marine Environment and Systems couldn't use M (already taken by Merchant Marine Safety, so it took W (for Waterways Management). And so on.

The 16 Offices of the Coast Guard and their functions are as follows:

G-C	**The Office of the Commandant** is charged with administering the Coast Guard, advising the Secretary of Transportation on matters regarding the Coast Guard, and maintaining liaison with public and private agencies.
G-CCS	**The Office of the Chief of Staff** (the exception to the rule that an Office is designated by a single letter) is charged with developing and coordinating the Coast Guard's policies and programs, with special emphasis on general administration and management.
G-B	**The Office of Boating, Public, and Consumer Affairs** is charged with a. overseeing the program for prevention of recreational boat casualties. This includes enforcement of Federal laws and regulations, supervision of Coast Guard Auxiliary operations, establishment of pleasure craft safety standards, administration of public education and training programs, and maintenance of liaison with other authorities and organizations concerned with boating safety. b. providing for a public relations and consumer affairs program aimed at keeping the private sector abreast of Coast Guard developments and events of general interest
G-D	**The Office of Research and Development** is charged with administering a program of research and development tailored to the needs of the Coast Guard for new or improved systems, equipment, methods, and procedures.
G-E	**The Office of Engineering** is charged with providing support in areas having to do with engineering, such as design, construction, maintenance, outfitting and alteration of vessels, aircraft, aids to navigation, shore establishments, machinery, and utilities.
G-F	**The Office of Comptroller** is charged with such things as maintaining accounts, disbursing funds, and overseeing financial management.
G-H	**The Office of Civil Rights** is charged with ensuring compliance with civil rights and equal opportunity policies, both within the Coast Guard itself and in its dealings with the public.
G-K	**The Office of Health Services** is charged with developing and implementing the overall health services program of the Coast Guard.
G-L	**The Office of the Chief Counsel** is charged with ensuring that the operations and activities of the Coast Guard are legally consistent with the requirements of the law and the rulings of higher authority.
G-M	**The Office of Merchant Marine Safety** is charged with overseeing the program for prevention of marine casualties, including the inspection of merchant vessels to ensure compliance with established standards, approval of vessel plans and equipment, and the development and application of standards for merchant marine personnel.
G-N	**The Office of Navigation** is charged with developing plans and providing resources for such Coast Guard operations as short range aids to navigation, radionavigation aids, and bridge administration.
G-O	**The Office of Operations** is charged with developing plans and providing resources for Coast Guard operations involving search and rescue, enforcement of laws and treaties, polar and domestic icebreaking operations, operational and military readiness, marine science, ocean operations, and intelligence and security.
G-P	**The Office of Personnel** is charged with such matters as hiring/recruiting, training, and assignment of personnel.

G-R **The Office of Reserve** is charged with training and assigning Reserve personnel and directing the Coast Guard Reserve Forces Program.

G-T The relatively new **Office of Command, Control, and Communications** (it was formed in May 1981) is charged with developing, overseeing, and acquiring the equipment for Coast Guard telecommunications and information systems.

G-W **The Office of Marine Environment and Systems** is charged with establishing and maintaining the Coast Guard's environmental program and a comprehensive ports and waterways system encompassing all aspects of marine transportation except vessel safety, aids to navigation, and bridge administration.

The last two letters of a staff symbol are, where possible, the initial letters of the first two substantive words in a division's name (exceptions are made where this would result in duplicates or a combination of letters with unpleasant connotations). G-MMI, for example, stands for the Marine Investigation Division of the Office of Merchant Marine Safety. Some division symbols are followed by numbers. These indicate a branch. G-MMI-1, for instance, is the Casualty Review Branch; G-MMI-2 is the Personnel Action Branch; etc. Planning and policy staffs, since they are not divisions, have just a single letter after the Office designation: G-MP is the Planning and Special Projects Staff in the Office of Merchant Marine Safety.

The following is a sampling of some of the other symbols you may have had occasion to use:

G-CMC - Marine Safety Council (Office of the Commandant)

G-CMA - Management Analysis Division (Office of the Chief of Staff)

G-BPA - Public Affairs Division (Office of Boating, Public, and Consumer Affairs)

G-LRA - Regulations and Administrative Law Division (Office of the Chief Counsel)

G-LMI - Maritime and International Law Division (Office of the Chief Counsel)

G-MVI - Merchant Vessel Inspection Division (Office of Merchant Marine Safety)

G-MVP - Merchant Vessel Personnel Division (Office of Merchant Marine Safety)

G-MVD - Merchant Vessel Documentation Division (Office of Merchant Marine Safety)

G-NSR - Short Range Aids to Navigation Division (Office of Navigation)

G-OSR - Search and Rescue Division (Office of Operations)

G-WER - Environmental Response Division (Office of Marine Environment and Systems)

G-WWM - Waterways Management Division (Office of Marine Environment and Systems)

Some of the divisions of the Office of Merchant Marine Safety have recently been reorganized. The Merchant Marine Technical Division (G-MMT) and the Cargo and Hazardous Materials Division (G-MHM) no longer exist in their old form. The functions of G-MMT that related to vessel inspections were transferred to G-MVI. Those functions related to the work done by G-MHM were transferred to that division, and the name was changed to the Marine Technical and Hazardous Materials Division, G-MTH. (G-MMT was not used, since that might have led to confusion with the former Merchant Marine Technical Division.)

CIMARRON: Guardian of the River

by Tom Gillespie, Photojournalist
U.S. Coast Guard Headquarters

As the early morning sun rose slowly through the Tennessee pines at Paris Landing, only the sounds of crickets and frogs competed with Senior Chief Petty Officer Donald Steerman's commands to cast off lines. Another week of buoy work on the Tennessee and Cumberland Rivers was about to begin for the Coast Guard Cutter CIMARRON.

"Our job on this river is to maintain the aids to navigation. We're the first line of defense for these towboaters," said Petty Officer First Class Will Taylor. "We keep the commerce traveling on the rivers."

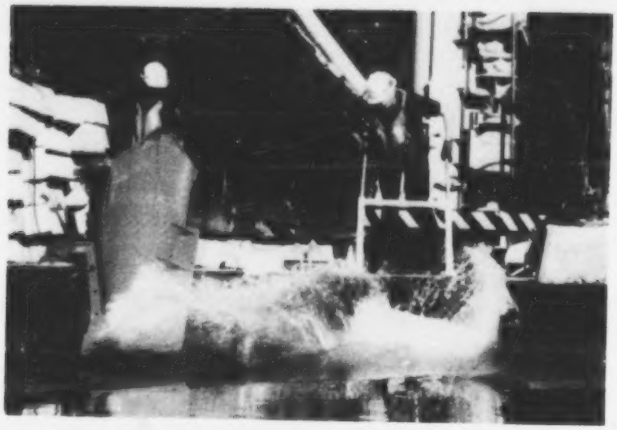
The CIMARRON has done a good job of keeping goods moving on the rivers--so good, in fact, that it won the National Defense Transportation Award as the Coast Guard's outstanding unit in 1980. It was an award earned though many long, hard hours on the river. In addition, the CIMARRON won its fourth consecutive excellence award from Coast Guard District inspectors.

"The CIMARRON keeps the river open and keeps it safe," added Group Tennessee River commander Harry Sites. "On this river, industry is big business, so it becomes imperative to keep the towboats moving. We want to make sure we have the best and the safest channel marked. That's our main concern."

Along with its sister ship, the OUACHITA, the CIMARRON services more than 1,200 miles of rivers with more than 1,500 buoys, shore structures, and safety landing markers.

Warrant Officer Sites explained the important job done by the CIMARRON: "Working navigational aids is not a glamorous job. It's a job that doesn't allow you to see the end result, but we try to instill pride in this work and the

The officer in charge of the CIMARRON, Donald Steerman, gives the word to the men on the buoy barge to drop the buoy on his signal.



As Senior Chief Steerman gives the word, the crewmembers drop the buoys overboard to remark the channel in the river.

feeling that if it's worth doing, it's worth doing right."

Keeping the navigational aids in place on the rivers is a never-ending struggle against the natural elements and errant commercial traffic on the river. Often the crew of the CIMARRON replaces as many as 60 percent of the buoys on one trip down the river.

The job is hard and often dangerous. "The buoys we use weigh 300 to 400 pounds, and the sinkers that hold them down weigh 1,500 to 2,000 pounds," said Petty Officer Third Class Fred Parsons. "When that much weight is swinging around on the buoy deck, you have to keep your eyes on the load and make sure you don't hit anybody. Everybody has to pay attention to what's goin' on on the buoy deck."

In addition to setting buoys, the crew must frequently reconstruct navigational lights along the river which have been knocked down by high water, bank erosion, and stray barge traffic. Twenty-foot towers must be constructed, guy wires strung, and reflective plywood "day markers" hoisted up the tower. Finally, 50 pounds of batteries must be hoisted up to power the lights.

Navigational light construction is a time-consuming, tedious job, but for the crew of the CIMARRON, it's all in a day's work.

Although navigational aids work is its prime concern, the crew of the CIMARRON must also respond to chemical and oil spills and numerous search-and-rescue cases—often on very short notice.

Retired tugboat captain Bill Harmon summed up the feelings of the river pilots for the job done by the CIMARRON and its hard-working crew: "I've been on the river 46 years, and I've seen a big change in it. There's a much better marked channel now.

"It's just better navigation now than before," Harmon continued. "Eight barges used to be a load. Now we're taking 35 or 40 barges down the river.

"If the Coast Guard weren't taking care of the navigational aids on the river, it would be unnavigable. We couldn't navigate with the loads we're taking down the river today," Harmon concluded.

Work on the inland rivers can often be a thankless job, but because of men and women like those on the CIMARRON, safe navigation is assured and goods can continue to move on the nation's rivers. ⚓

One job of the crew is to maintain the navigational lights and markers along the riverbank. High water and bank erosion make the job even more difficult than it would normally be.

A Reader Replies to "The Wake of the TITANIC"

*Captain Gunnar Olsborg is an Ocean Master Mariner and a long-time Puget Sound pilot. He is also a member of the Titanic Historical Society and has read extensively on the subject of the TITANIC's sinking. The following is taken from a letter Captain Olsborg wrote in response to the article "The Wake of the TITANIC" by PA3 Jeffrey D. Moore (*Proceedings, *January 1982):*

"I first became interested in accident prevention when, as a young ordinary and able-bodied seaman standing a wheel watch, I was privileged to hear captains, mates, and pilots describe how ships or docks were rammed or groundings occurred because of improper engine maneuvers or other causes.

"I believe [the TITANIC] could have been saved along with all hands if proper action had been taken.

"I have reviewed the accident periodically for 30 years and have expounded on my theory when discussing or giving talks on this subject. I have yet to have a seafarer dispute me.

"I trust you will excuse the lengthy buildup on the way to explaining what I believe went wrong on the third night out, just hours before what must have been the most newsworthy event of 1912.

"Needless to say, had Captain Edward J. Smith taken heed of the several ice reports delivered by Marconi wireless, the accident would perhaps not have happened.

"However, the commodore of the White Star Line was perhaps all fired up like the other officials and passengers . . . After all, the TITANIC was an 'unsinkable ship' and not in need of sufficient lifeboats and rafts to accommodate all passengers and crew. Needless to say, such lifesaving standards were immediately revised.

"The TITANIC, a floating palace with some 2,200 on board, had been running in thick, patchy fog conditions during the early evening when even the stars overhead were sometimes visible.

"The lookout man in the crow's nest sighted the iceberg about 23 minutes before midnight and reported same immediately to the bridge, whereupon Chief Officer Murdoch must have taken a few seconds with the binoculars to determine that the oncoming apparition was indeed close ahead . . . [he then] gave the order 'hard astarboard,' a throwback to the days of sail when the helm or tiller was placed to starboard in order to swing the bow to port, followed by a full astern backup on both engines. Strange as it might seem, this method of helm orders prevailed until 1936.

"The accident occurred in less than three

Proceedings
of the Marine Safety Council
U.S. Department of Transportation
United States Coast Guard
Vol. 39, No. 1
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CG-129

A number of readers have called or written to ask about the drawing on the cover of the January 1982 issue. This picture of the TITANIC appeared in the May 1912 issue of Scientific American. (Artist unknown) minutes while the engineers, unprepared for the emergency, were frantically trying to stop and reverse the propellers. No one knows for certain if the backup maneuver had actually started to any appreciable extent when the underwater hull sideswiped and tore a hole in the ship described as being roughly 8 inches in height over a distance of 300 feet, flooding at least 4 compartments. Most ships of this size are generally designed to allow for the flooding of any 2 compartments without serious loss of stability. Naturally, the ship was doomed.

"One can hardly fault the chief officer for the attempted escape action that was undertaken [during the initial excitement].

"Perhaps in those days, unlike today, accidents were not visualized in advance for near automatic response in order to escape or at least minimize the disaster.

"Based on what we now know, the best avoidance action would have been to try and steer away from the hazard with a possible full backup on only the port engine. Unfortunately, this was not done.

". . . the next mistake was the failure of Captain Smith to recover from his shock . . . [he paid more attention to] a technical investigative report as to how much longer the ship would remain afloat [than the need] to take immediate and decisive action.

"This is when, as the fog immediately cleared after the accident, revealing several nearby large icebergs including the one just hit, the captain should have steered square on to one of the nearby large icebergs at a speed of four to six knots or more for the purpose of stabilizing and holding the bow in a rather rigid position with the engines running ahead . . . [this would have certainly been] possible because of the flat, calm sea conditions prevailing at the time.

"Had this been done, Captain Arthur Rostron on the CARPATHIA [might] well have effected a full rescue.

"The ship might even have been saved by the use of canvas, dunnage, mattresses, etc. to stanch the flow of water commensurate with the ability of the pumps to maintain stability. Had this been done, it is possible that the ship could have been brought into the nearest port for beaching and repair.

"Despite the misfortune of the accident, Captain Edward J. Smith could have faced retirement as a hero, the same as the master of the CARPATHIA.

"Captain Smith must not have been unmindful of the passenger steamer ARIZONA, which in 1879 accidentally ran at full speed into an iceberg, crushing her bow and then backing all the way to Newfoundland for repairs.

"While the speed of the ARIZONA is not known, it could hardly have been less than 15 knots, inasmuch as passenger steamers in the mid-1880s were already doing nearly 20 knots, or about 22½ miles per hour.

"In 1922 the passenger vessel MONTROSE, [moving] at perhaps 20 knots, inadvertently encountered an iceberg in roughly the same sideswiping manner as the TITANIC and deliberately threw the steering wheel over to meet the berg head-on and at nearly full speed.

"Naturally much damage to the bow ensued, but only the forward hold was flooded, and the vessel was able to make Liverpool with all her passengers and nearly all the cargo intact.

"Likewise in 1923, the fastest passenger ship in the world (27 knots), while on a run from San Francisco to Seattle at a speed of 22 knots in thick fog, ran into a steep, nearly vertical rock on the northwestern Washington coast.

"The bow collapsed for some 30 or 40 feet, and the ship steamed astern for 150 miles into Seattle, again without loss of life.

"In view of the fact that we are soon observing the 70th anniversary of one of history's most outstanding maritime peacetime disasters,* may I compliment [Mr. Moore] for a most timely review."

Very sincerely,

Gunnar Olsborg

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* *Editor's note: Captain Olsborg's letter was dated February 24, 1982.*

Chemical of the Month

*This is the first in a series of four articles discussing derivatives of the chemical benzene.**

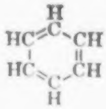
Toluene: $C_6H_5CH_3$

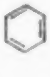
Synonyms:	Toluol Methyl benzene
Physical Properties	
boiling point:	111°C (231°F)
freezing point:	-95°C (-139°F)
vapor pressure at	
20°C (68°F):	22 mm Hg
25°C (77°F):	28 mm Hg (approx.)
Threshold Limit Values (TLV)	
time weighted average:	100 ppm; 375 mg/m^3
short term exposure limit:	150 ppm; 560 mg/m^3
Flammability Limits in Air	
lower flammability limit:	1.2% vol.
upper flammability limit:	7.1% vol.
Combustion Properties	
flash point (c.c.):	4°C (40°F)
autoignition temperature:	480°C (896°F)
Densities	
liquid (water = 1.0):	0.9
vapor (air = 1.0):	3.1
Identifiers	
U.N. Number:	1294
CHRIS Code:	TOL
Cargo Compatibility Group	32 (Aromatic Hydrocarbons)

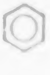
Toluene (TOL-yoo-een) is perhaps most familiar to non-chemists as the second "T" in "TNT"—formally known as trinitrotoluene. It was discovered in a much less violent context in 1838 by two organic chemists working in Paris, P. Joseph Pelletier and Philippe Walter, a Polish-born emigre. The two scientists were doing research on the products obtained by heating a type of balsam used in medicines and perfumes. This balsam, a natural resin, came from the Tolue tree of northern South America—hence, the name of the chemical.

Chemists think of toluene as a member of a family of chemicals called *aromatic hydrocarbons.* The structure of the organic chemicals which make up this family is based on the ring structure of the benzene molecule (see diagram below). The family name was derived from the generally pleasant odor of the first few family members identified.

Benzene, C_6H_6, the parent compound, is illustrated by chemists in the following way:

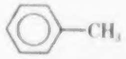
I. 

II. 

III. 

To a chemist, these are simply three different ways of indicating the same structure. For simplicity's sake, we will use the third illustration throughout this series.

Toluene, $C_6H_5CH_3$, is the second member of the aromatic hydrocarbon family. It is a benzene ring in which one of the hydrogen atoms, H, has been replaced by a methyl group, $-CH_3$. Toluene can be drawn the following way:



About half the toluene produced in the U.S. today is used to make benzene. The process involved is called "dealkylation" and consists of removing the methyl group. Some toluene is used along with other materials to improve the octane quality of gasoline. Toluene is also an excellent solvent for many oils, fats, waxes, paints and lacquers, and rubber. It is a prime starting material for a host of other chemicals, including benzoic acid (which, in turn, is used to produce phenol), caprolactam, and various chlorotoluenes. Toluene is also a starting material for the artificial sweetener saccharine.

In 1980, the latest year for which figures on chemical production in the U.S. are available, toluene ranked 15th in volume (benzene was 16th).

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* *For a discussion of benzene, see CG-482, "Benzene, Safe Handling Practices," available from Commandant (G-CMA-3), U.S. Coast Guard, Washington, DC 20593.*

Production methods have come a long way from the days of heating balsam. Toward the end of the 19th century toluene was being recovered as an important by-product of the process used to make coke from coal for the steel industry. This is still a source of toluene, although limited. Currently, about 95 percent of the toluene produced in the U.S. comes from several petroleum and petrochemical processes. This type of production first became economically viable during World War I, when the need for TNT increased. The process was refined and production costs thus cut in the years preceding World War II, when research was being conducted on methods to produce high-octane aromatic concentrates from petroleum for premium gasolines. Because the need for TNT again increased, these methods were converted to ultimately produce high-purity toluene. This was the beginning of the commercially important, and very large, petroleum aromatics industry in the U.S. While toluene was the principal product made during the war, these processes are used today to produce primarily what are called "BTX fractions," consisting of various percentages of benzene, toluene, and another benzene derivative, xylenes. These BTX fractions can then be separated into the different components.

There are several different grades of toluene. Two very pure grades are known as reagent grade, used principally by chemists, and nitration grade, used for making dyes, TNT, and toluene diisocyanate *(see the May 1982 issue of the* Proceedings). There are also three less pure industrial grades.

The primary hazard of toluene is its flammability. Its flash point, the temperature at which its vapor will ignite if exposed to a source of ignition, is a mere 4°C (40°F), and concentrations with as little as 1.2% toluene by volume in air are flammable. Since toluene vapor is heavier than air, it may travel along the ground or deck and, if ignited, flash back to its origin. Carbon dioxide, dry chemical, or foam are used to fight fires involving toluene.

Short-term overexposure to toluene may cause irritation of the eyes, skin, and respiratory tract. Inhalation of toluene vapors produces narcotic effects such as feelings of fatigue, muscular weakness, dizziness, drowsiness, confusion, and headaches. Cases of extreme overexposure have caused severe but reversible liver and kidney damage. Liquid toluene splashed in the eyes can result in irritation and temporary, reversible damage. Long-term exposure to toluene causes the skin to dry and crack because its solvent action, which makes it so valuable industrially, breaks down the body's oils. This is temporary but in cases of extreme exposure can be rather painful.

To protect themselves from exposure to the liquid, personnel should wear impervious clothing, gloves, and face shields/splash-proof safety goggles. Contaminated clothing should be removed and thoroughly washed before being reworn (note: keep it away from sources of ignition). Affected skin areas should be washed with soap and water and the eyes flushed with plenty of water. In cases of ingestion (swallowing), vomiting should not be induced because of the danger of aspiration: if the toluene gets into the lungs, it can cause chemical pneumonia. Inhalation overexposure is treated by removal of the victim to fresh air.

Because of toluene's close structural relationship to benzene, it had been feared that it would cause similar toxicity problems for the blood and blood-forming organs (leukemia). This has not proved to be the case, however. Pure toluene does not seem to have these toxic effects. Toxicity is a problem only with the industrial grades, and that is because of the varying amounts of benzene (up to 25 percent) they contain. Results of human and animal tests indicate that alkylation of the benzene ring (in the case of toluene, the addition of a methyl group) results in a loss of the myelotoxic activity (destruction of bone marrow) exhibited by benzene. The major toxicity problem of toluene is its narcotic effects, which are readily reversible and easily avoided by simple precaution.

Toluene is regulated by the U.S. Coast Guard as a Subchapter D commodity (this reflects the fact that its primary hazard is flammability). Regulations governing those grades of toluene containing 10 percent or more benzene are found in Subchapter O, Part 151, of the Code of Federal Regulations—for tank barges—and—for tank ships—in Chapter VI of the Chemical Code of the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization). The U.S. Department of Transportation classifies toluene as a flammable liquid. Both the Environmental Protection Agency and IMO consider it a Class C pollutant.

Hazard Evaluation Branch
Marine Technical and
Hazardous Materials Division

Next month: xylene

Lessons from Casualties

Editor's note - The following article was submitted by Professor Louis S. Hathaway of the Maine Maritime Academy. He received it from Bob Wallace, a graduate of the Academy who is now working for Federal Commerce and Navigation Ltd. of St. John, New Brunswick.

I assume it was written tongue-in-cheek but will stand corrected if the incident sounds familiar to any of our readers.

The author, who appears to be British, is unknown, and we are thus unable to give him credit.

It is with regret and haste that I write this letter to you, regret that such a small misunderstanding could lead to the following circumstances, and haste in order that you will get this report before you form your own preconceived opinions from reports in the world press, for I am sure that they will tend to overdramatise the affair.

We had just picked up the pilot, and the apprentice had returned from changing the "G" flag for the "H" and, it being his first trip, was having difficulty in rolling the "G" flag up. I therefore proceeded to show him how. Coming to the last part, I told him to "let go." The lad, although willing, is not too bright, necessitating my having to repeat the order in a sharper tone.

At this moment the Chief Officer appeared from the Chart room, having been plotting the vessel's progress, and, thinking that it was the anchors that were being referred to, repeated the "let go" to the Third Officer on the forecastle. The port anchor, having been cleared away but not walked out, was promptly let go. The effect of letting the anchor drop from the "pipe" while the vessel was proceeding at full harbor speed proved too much for the windlass brake, and the entire length of the port cable was pulled out "by the roots." I fear that the damage to the chain locker may be extensive. The braking effect of the port anchor naturally caused the vessel to sheer in that direction, right towards the swing bridge that spans a tributary to the river up which we were proceeding.

The swing bridge operator showed great presence of mind by opening the bridge for my vessel. Unfortunately, he did not think to stop the vehicular traffic, the result being that the bridge partly opened and deposited a Volkswagen, two cyclists, and a cattle truck on the foredeck. My ship's company are at present rounding up the contents of the latter, which from the noise I would say were pigs. In his efforts to stop the progress of the vessel, the Third Officer dropped the starboard anchor, too late to be of practical use, for it fell on the swing bridge operator's control cabin.

After the port anchor was let go and the vessel started to sheer, I gave a double ring Full Astern on the Engine Room Telegraph and personally rang the Engine Room to order maximum astern revolutions. I was informed that the sea temperature was 53° and asked if there was a film tonight; my reply would not add constructively to this report.

Up to now I have confined my report to the activities at the forward end of the vessel. Down aft they were having their own problems. At the moment the port anchor was let go, the Second Officer was supervising the making fast of the after tug and was lowering the ship's towing spring down onto the tug.

The sudden braking effect on the port anchor caused the tug to "run in under" the stern of my vessel, just at the moment when the propeller was answering my double ring Full Astern. The prompt action of the Second Officer in securing the inboard end of the towing spring delayed the sinking of the tug by some minutes, thereby allowing the safe abandoning of that vessel.

It is strange, but at the very same moment of letting go the port anchor there was a power cut ashore. The fact that we were passing over a "cable area" at that time might suggest that we may have touched something on the river bed. It is perhaps lucky that the high-tension cables brought down by the foremast were not live, possibly being replaced by the underwater cable, but owing to the shore blackout it is impossible to say where the pylon fell.

It never fails to amaze me, the actions and behaviour of foreigners during moments of minor crisis. The pilot, for instance, is at this moment huddled in the corner of my day cabin, alternately crooning to himself and crying after having consumed a bottle of gin in a time that is worthy of inclusion in the Guinness Book of Records. The tug captain, on the other hand, reacted violently and had to forcibly be restrained by the Steward, who has him handcuffed in the ship's hospital, where he is telling me to do impossible things with my ship and my person.

I enclose the names and addresses of the drivers and insurance companies of the vehicles on my foredeck, which the Third Officer collected after his somewhat hurried evacuation of the forecastle. These particulars will enable you to claim for the damage that they did to the railings of the No. 1 hold.

I am closing this preliminary report, for I am finding it difficult to concentrate with the sound of police sirens and their flashing lights.

It is sad to think that had the apprentice realized that there is no need to fly pilot flags after dark, none of this would have happened.

For weekly Accountability Report I will assign the following Casualty Numbers: T/750101 to T/750199 inclusive.

Yours truly,

MASTER

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. At the commencement of a foreign or intercoastal voyage, a legible copy of the shipping articles (Forecastle Card) must be posted at a place accessible to the crew. The responsibility for this is that of the

A. shipping company.
B. master.
C. U.S. Coast Guard
D. U.S. Customs Service

REFERENCE: 46 CFR 14.05-2

2. One of the causes of ocean currents is density differences in the water. This is true because

A. the water surface is lower in an area of high density than in an area of low density.
B. surface water flows from an area of high density to one of low density.
C. the lesser the density gradient, the freer the water is to move.
D. it is the density differences that cause the currents to stay in the troughs.

REFERENCE: Bowditch

3. When using the international flags and pennants, if the receiving station can distinguish the flag signal of the transmitting station but cannot understand the meaning of it, it can hoist the flag signal

A. ZP.
B. ZQ.
C. ZR.
D. ZK.

REFERENCE: H.O. 102

4. On most merchant ships the vessel will heel inwards if

A. the vessel has very little draft.
B. GM is below the center of lateral resistance.
C. GM is above the center of lateral resistance.
D. the vessel is deeply laden.

REFERENCE: *Modern Ships*, LaDage

5. Which statement(s) is (are) true concerning a dehumidification system which employs silica gel?

I. All air going into the dehumidifier is filtered.
II. The silica gel never has to be replaced if it is kept clean.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

REFERENCE: *Marine Cargo Operations*

ENGINEER

1. What is the speed of the camshaft in a two-stroke-cycle diesel engine when the crankshaft is turning 625 rpm?

A. 312
B. 425
C. 625
D. 1,250

REFERENCE: Maleev

2. Injection lag in a diesel engine may be caused by

A. the compressibility of fuel oil.
B. the high viscosity of diesel fuel.
C. mechanical rigidity in the fuel pump mechanism.
D. an increase in the fuel pump delivery pressure.

REFERENCE: Maleev

3. The most practical way of detecting an overload in one cylinder of an operating diesel engine is to

A. check the exhaust for black smoke.
B. listen for combustion knock in that cylinder.
C. isolate each cylinder and inspect the injector.
D. check the cylinder exhaust temperature frequently.

REFERENCE: Stinson

4. If lost motion is present in an individual type fuel injection pump, what will occur?

A. More fuel will be injected.
B. Fuel injection will remain unchanged.
C. Fuel injection will occur earlier.
D. Fuel injection will occur later.

REFERENCE: Maleev

5. The most common instrument used to measure exhaust pressure in a diesel engine is the

A. pyrometer.
B. Bourdon gauge.
C. pneumercator.
D. manometer.

REFERENCE: Stinson

ANSWERS

DECK
1.B;2.A;3.B;4.B;5.C
ENGINEER
1.C;2.A;3.D;4.D;5.D

Prove that Your EPIRB is Working

(Reprinted from Chevron Shipping Company's Safety Bulletin, *December 1981)*

For proof positive that your vessel's EPIRB will transmit a full-power signal if needed:

1. Collect the EPIRB, a small FM radio, a half-filled bucket of water, and a watch.

2. Check the EPIRB's battery by operating the test switch.

3. Turn on the FM radio and tune it to 99.5 MHz.

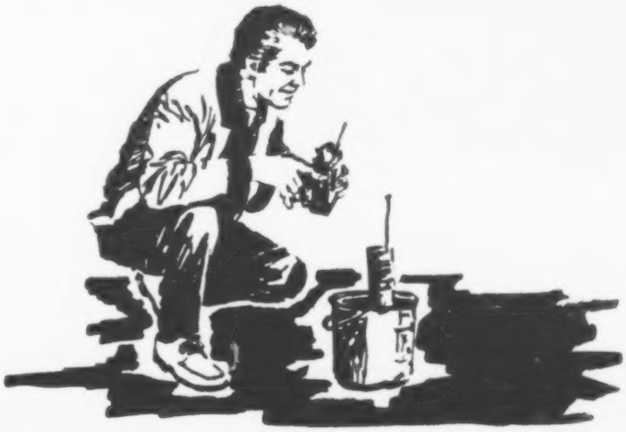
4. Check the time. The full-power test can be made only during the International Distress Frequency Test Period—from 00 to 05 minutes of any hour.

5. When the time is right, dunk the bottom of the EPIRB into the water, watch the indicator lamp, and listen to the radio.

If the EPIRB is working properly, the indicator lamp will light and you will hear the EPIRB signal—an oscillating tone—on the radio. Pull the EPIRB out of the water as soon as you hear the signal.

This full-power test transmission *must not* last longer than 1 second or 3 audio sweeps.

If you don't hear the signal on the radio, then your EPIRB is in need of service. Perform this test each month and enter the results in the radio log.



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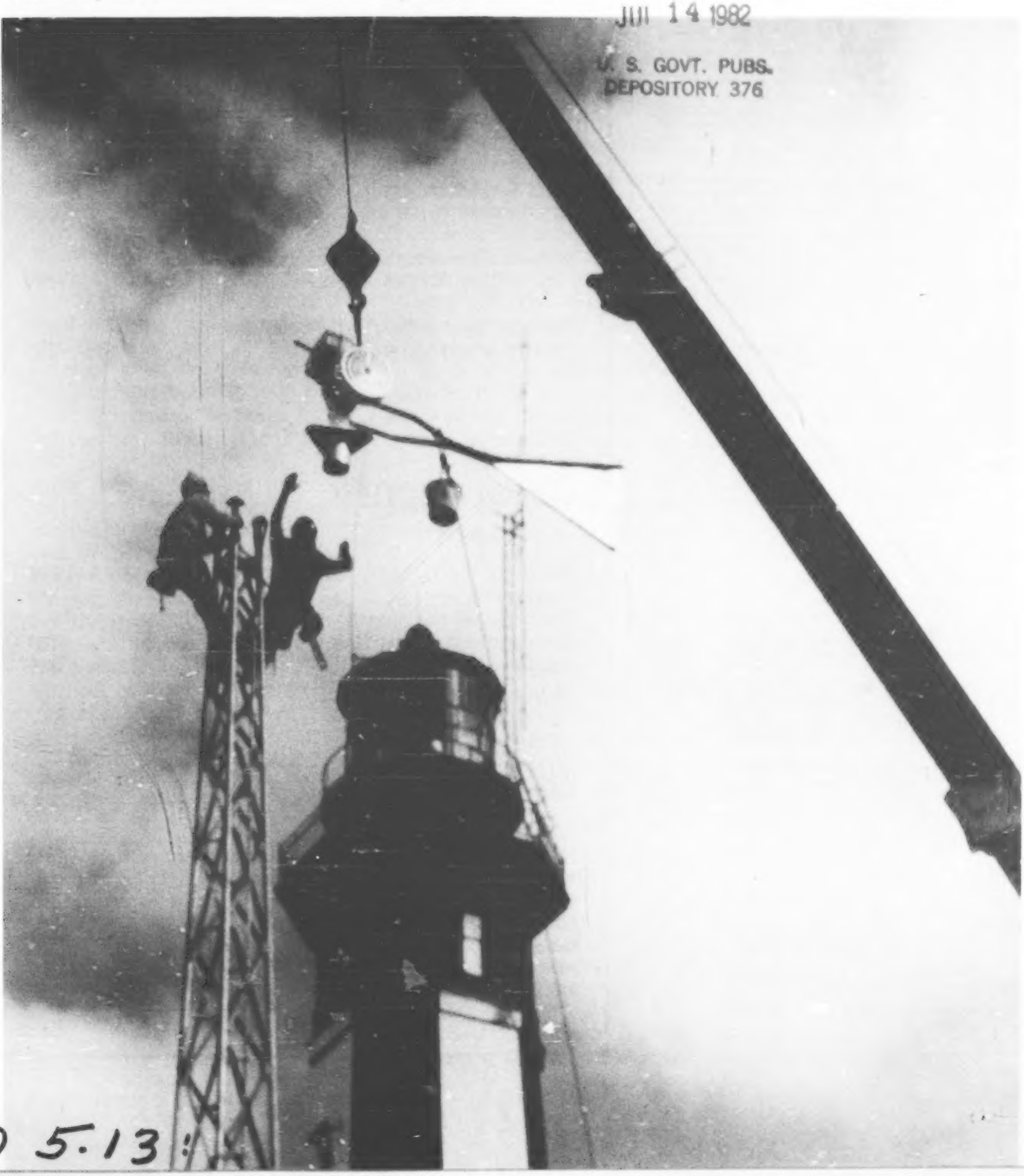

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of the Marine Safety Council

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cover

Concerned about the escalating costs of diesel fuel and the shortage of trained personnel needed to maintain remotely sited lighthouses and their generators, the Coast Guard initiated a project in 1979 aimed at developing alternate power sources. A report on the prototype wind machine being tested at the Cape Henry (Virginia) light station begins on page 207.

Cooperation Requested During World's Fair

The Nashville District of the U.S. Army Corps of Engineers would like to remind waterway users that certain restrictions will be in effect through October 31, 1982, during the World's Fair in Knoxville, Tennessee.

A great many recreational vessels are expected in the area during the fair. Also, several barge exhibits, excursion boats, helper boats, and floating docks are temporarily moored along the right bank, Mile 647 - 648. Official boats used by city, state, and Federal agencies and authorized ferries will be allowed to temporarily moor to the two floating docks between the Southern Railway Bridge and the Henley Street Bridge. No other vessels will be allowed to moor to these docks. Controlled recreational mooring will be permitted to the temporary dock upstream of the Henley Street Bridge, but at no time will these boats be allowed to extend into the channel further than the right channel pier of the bridge (approximately 80 feet from the shoreline).

Pilots on all tows are requested to contact the M/V SHIRLEY B (helper boat) on Channel 13 or other vessels in the area well in advance of arrival to ascertain navigation conditions and advise of their plans. It may be necessary for tows to double-trip through the restricted (135-foot-wide) channel span of the railroad bridge at Mile 647.2.

Please enclose your mailing label when sending in a change of address.

Workshop on Hazardous Materials Offered

The training/consulting firm Eugene H. Schreiner & Associates will be offering summer workshops in cities across the country on the transport of hazardous materials and substances.

Each of the one-day workshops is to be tailored to the needs of the participants. The workshops are designed to give participants a "nuts-and-bolts" understanding of what they must do to comply with regulations promulgated by the U.S. Department of Transportation and the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization). Attendees will also take home copies of a 100-page manual that will serve as a guide for future problems in understanding regulations.

Further details are available from Eugene H. Schreiner & Associates, 22916 Runnymede Street, Canoga Park, CA 91307; (213) 347-4196.

New Edition of Chemical Data Guide Released

The Coast Guard's Technical and Hazardous Materials Division recently completed work on the 6th edition of the Chemical Data Guide for Bulk Shipment by Water, CIM 16616.6 (old CG-388). This guide was developed in 1965 to provide a convenient, easy-to-use reference on properties and emergency procedures for bulk liquid cargoes. The new edition contains data on over 300 cargoes.

In addition to the data on cargoes, the guide includes an update on chemical compatibility, a list of known or suspected carcinogens, and a description of the CHRIS system and the CHRIS manuals.

Copies of the guide can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (GPO Stock No. 050-012-00186-3). The price of the volume is $9.00.

OSHA Consolidates Standards for Shipyard Employment

In a final rule published in the FEDERAL REGISTER on April 20, 1982, the Occupational Safety and Health Administration consolidated its existing standards pertaining to shipyard employment. The standards previously comprised Parts 1915, 1916, and 1917 of Title 29 of the Code of Federal Regulations, covering ship repairing, shipbuilding, and shipbreaking, respectively. Since many of the standards are the same for each of the three operations, there was much duplication. OSHA's action consolidates the standards into a single, comprehensive Part 1915.

By eliminating repetitive provisions, OSHA will reduce the volume of the shipyard standards by approximately two-thirds. Further, by consolidating the standards, it will make them easier to use and simplify future revisions.

OSHA wishes to emphasize that this consolidation action involves only editorial and other minor changes to the shipyard standards. It does not alter the substantive requirements of the standards themselves, nor does it change their present scope and application.

The rule went into effect May 20, 1982. For further information, contact M. Robert Daly, Office of Maritime Safety Standards, Occupational Safety and Health Administration, Room N3471, U.S. Department of Labor, 200 Constitution Ave. NW, Washington, DC 20210; (202) 523-7234.

Stability of Surface Effect Ship Studied

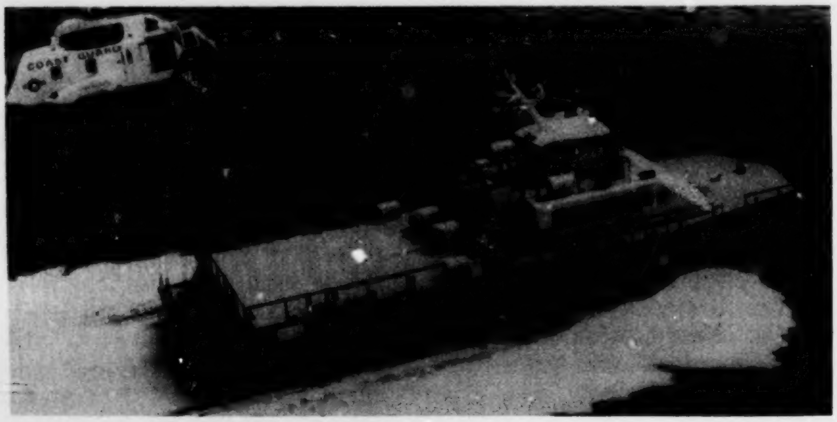
Among modern high-performance marine vessel concepts, the surface effect ship, or SES, is receiving much attention, both as a commercial vessel and as a candidate for Coast Guard use. Because of the ship's unconventional design, much needs to be learned about the relative safety of the SES, especially when it is moving at high speeds.

The Coast Guard's Office of Research and Development has completed a study examining several types of hazards and adverse ship motions that an SES can encounter while traveling at high speeds. Some of these hazards and motions are:

- plow-in (burying the bow in the water) as a result of shifting or gross misalignment of cargo,
- broaching (veering dangerously so as to be broadside to the wind) as a result of severe wind and sea conditions, and
- capsizing in high-speed turns.

From scale-model and full-scale test information, a mathematical model was developed and stability guidelines created for the SES designer. The guidelines will enable the designer to determine whether or not a proposed SES design should have adequate stability.

Copies of the project report, "Development of Intact Stability Standards for Rigid-Sidehull Surface-Effect Ships," can be obtained from the National Technical Information Service, Springfield, VA 22161, by specifying Report No. CG-D-53-81, Accession No. AD A110-567.



The unconventional design of the high-performance Surface Effect Ship makes special stability considerations necessary.

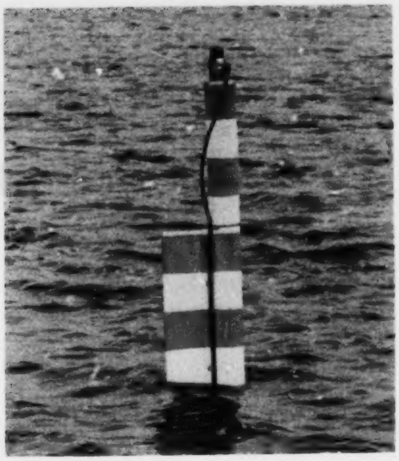
"Articulated Spar": A Better Short-range Aid?

The Coast Guard presently maintains close to 27,000 aids to navigation buoys in harbors, rivers, lakes, and coastal areas in the U.S. In addition, the aids to navigation system includes many fixed structures ranging from small daymarks to offshore towers.

Standard lighted buoys are typically anchored by a rectangular concrete block linked to the floating buoy by an iron chain. Usually the length of this chain is two to three times the depth of the water in the vicinity of the buoy. This provides sufficient slack to compensate for variations in tide, wind, waves, and current. Unfortunately, this also permits the buoy to stray from a precise location and thereby makes the aid inaccurate for purposes of navigation.

Fixed aids are preferred to buoys because of their stable position. Nevertheless, floating debris, ice, or passing vessels occasionally strike them, sometimes rendering them useless as aids or even creating a submerged hazard to mariners.

As an alternative to both buoys and fixed aids, the Office of Research and Develop-



The Coast Guard hopes the "articulated spar" buoy will be free of the problems that plague chained buoys and fixed aids.

ment is considering the merits of an "articulated spar" buoy. This type of buoy consists of an anchor, universal joint (or similar pivoting joint), and rigid cylinder (the spar) extending from the anchor joint to above the water surface. Being free to pivot at its attachment point, the aid is less subject to damage from impact. Moreover, the range of motion of the exposed top would generally be much less than with chained buoys.

A report just released by the Coast Guard's Office of Research and Development provides a prediction model to estimate the amount of listing of the articulated spar buoy subjected to the forces of wind and water. The analytical model was verified by comparison with laboratory and field test data.

Copies of this reports, "Design of an Articulated Spar Buoy," can be obtained from the National Technical Information Service Springfield, VA 22161, by specifying Report No. CG-D-71-81, Accession No. AD A110-561.

Thirteenth Country Ratifies Marpol

The Federal Republic of Germany became the 13th country to ratify the international convention for the Prevention of Pollution from Ships as modified by the Protocol of 1978 (Marpol 73/78). The convention will enter into force one year after being accepted by 15 countries whose combined merchant fleets amount to 50 percent of world gross tonnage. The countries which have ratified the convention so far control fleets representing 41 percent of the world tonnage. If Greece and Italy ratify this convention, the requirements could enter into force as soon as the first quarter of 1983.

(Reprinted from the March 1982 Safety Bulletin *of Imperial Oil, Ltd.)*

Invitation to Participate in Film Festival

Interested persons from industry, government, conservation groups, societies, and research institutes, as well as exhibitors and conference participants are invited to submit films to be shown at a film festival during the 1983 Oil Spill Conference.

The four-day international meeting will be held February 28 - March 3, 1983, at the San Antonio Convention Center, San Antonio, Texas. Sponsors will be the American Petroleum Institute, the U.S. Environmental Protection Agency, and the U.S. Coast Guard.

This will be the eighth such conference held under industry/government co-sponsorship. Approximately 1,100 persons attended the last conference in 1981, and a comparable turnout is expected at the 1983 conference.

Because of the film festival's popularity in the past, it is expected that the festival will run throughout the conference. Films shown will cover a broad range of oil pollution prevention and control subjects.

Films must be submitted for review before January 5, 1983. Films submitted should be timely, related to the topic of the conference, and in English. Only industry standard 16mm films with optical sound will be considered. No sales-oriented films will be accepted. Videotape will not be accepted.

Films should be sent to:

Charles H. Rentz
Public Affairs Coordinator,
Port Arthur
Texaco U.S.A., Inc.
P.O. Box 712
Port Arthur, TX 77640
Tel.: (713) 983-2066

Inaugural Seafarers Health Improvement Program (SHIP) Sessions Held

Under the new sponsorship of the Maritime Administration, the reorganized Seafarers Health Improvement Program (SHIP) held inaugual meetings in Washington, DC March 31 - April 1, 1982. Approximately 100 participants from government, management, and labor participated under an agenda and procedural guidelines set by the 15-member SHIP Executive Committee, which met three times prior to these sessions.

In opening the meetings, MarAd administrator Admiral Shear emphasized several areas of weakness in maritime medical matters and tasked SHIP with developing seafarer physical standards, alternative sources of medical attention, and training and other medical treatment standards, and establishing a control center for seafarers' health records within 6 to 12 months.

Memberships were announced for Working Groups on Physical Standards for Seafarers, Access to Care Ashore, Care and Services at Sea, Shipboard Occupational and Environmental Health, and Medical Data and Records. Each group initiated work programs and drafting efforts in accordance with its terms of reference. All recommendations and similar documentation generated by SHIP Working Groups will pass through the Executive Committee for its ultimate consideration and acceptance by the SHIP Committee of the Whole.

Arthur W. Friedberg, Director, Office of Maritime Labor and Training, MarAd, is Moderator of SHIP, Chris Krusa, Office of Maritime Labor and Training, MarAd, is Administrative Secretary, and Captain Robert E. Hart, President, Marine Index Bureau, Inc., is Executive Secretary/Spokesman of SHIP.

The procedures of the SHIP structure are designed to ensure total participation and review by all involved constituencies prior to any implementing actions.

(Reprinted from the Activities Letter *of the American Institute of Merchant Shipping, April 19, 1982)* ‡

Keynotes

The following items of general interest were published between April 22, 1982, and May 20, 1982:

Final rules: CGD 82-044 Safety and Security Zones Quarterly List, April 29, 1982. CGD 09-80-01 Anchorage Regulations; Lake Winnebago, Oshkosh, Wisconsin, April 29, 1982. CGD 09-82-02 1982 Cleveland National Air Show, April 29, 1982. CGD 09-82-05 Regatta Regulations; Joe Gimborne Memorial Regatta, April 29, 1982. CGD 01-07-82 Drawbridge Operation Regulations; Weymouth Fore River, Weymouth, Massachusetts, April 29, 1982. CGD 09-82-07 Drawbridge Operation Regulations; Wolf River, Wisconsin, April 29, 1982. CGD 80-157 Implementation of Inland Navigation Rules, correction, April 29, 1982. CGD 81-032 Optional Simplified Admeasurement Method for Commercial Vessels, April 29, 1982 *(See the Keynotes in the March 1982 issue).* CGD 13-82-04 Regatta Regulations; Columbia River, Washington, April 29, 1982. CGD 09-82-03 Regatta Regulations; B and T Icebreaker Regatta, Niagara River, New York, April 29, 1982. CGD 09-82-01 Special Local Regulation; Duluth Harbor Fireworks, Duluth, Minnesota, April 29, 1982. CGD 81-104 Discharge Review Board Regulation, May 3, 1982. CGD 11-80-08 Anchorage Regulations; Los Angeles—Long Beach Harbor, California, May 6, 1982. CGD 82-029 Regulation Update for Inland Navigation Rules, May 6, 1982. CGD 81-040 Shipping Safety Fairways, Adoption of U.S. Army Corps of Engineers Designations, May 6, 1982. CGD 03-77-212A Anchorage Regulations; Delaware Bay and River, May 10, 1982. CGD 09-82-04 Establishment of Special Anchorage Area, Fish Creek Harbor, Fish Creek, Wisconsin, May 10, 1982. CGD 77-136 1972 COLREGS, correction, May 10, 1982. CGD 02-82-01 Drawbridge Operation Regulations; Muskingum River, Ohio, May 10, 1982. CGD 03-81-034 Drawbridge Operation Regulations; Passaic River, New Jersey, May 17, 1982. CGD 03-82-04R Safety Zone; Penns Landing Park, Delaware River, May 17, 1982. CGD 05-82-02R Marine Event; Norfolk Harborfest, Norfolk, Virginia, May 20, 1982.

Notices of proposed rulemaking (NPRMs): CGD 09-80-02 Anchorage Regulations; Little Traverse Bay, Lake Michigan, Harbor Springs, Wisconsin, May 6, 1982. CGD 08-82-10 Safety Zone, Calcashieu Channel, Lake Charles, Louisiana, May 14, 1982. CGD 12-82-01 Drawbridge Operation Regulations; San Joaquin River, California, May 17, 1982.

Notices: CGD 82-045 National Boating Safety Advisory Council; Meeting, April 22, 1982. CGD 82-048 Towing Safety Advisory Council; Request for Applications, May 10, 1982. CGD 82-047 Qualification as a U.S. Citizen; Dundee Cement, May 10, 1982. CGD 82-049 Qualification as a U.S. Citizen; Texasgulf, Inc., May 10, 1982. CGD 82-050 Equipment, Construction, and Materials; Approval Notice, May 14, 1982. CGD 82-052 Ship Structure Committee; Meeting, May 17, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

ASME Stamp Approved for Pressure Vessels
(CGD 77-147)

The Coast Guard has issued regulations that will require that Class I, II, and III pressure vessels be inspected and stamped in accordance with the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code. In the past, the Coast Guard had to approve the vessel's construction plan and conduct a shop inspection. ASME inspectors are more readily available to perform the shop inspections than the Coast Guard is. The regulation will also require that the pressure vessel be certified by a registered professional engineer. This will minimize the time needed for Coast Guard preinstallation inspections.

For further information, contact Howard Hime, U.S. Coast Guard (G-MTH-2), Washington, DC 20593; (202) 426-2160.

Tank Vessel Restrictions for Puget Sound Finalized
(CGD 78-041)

The waters of Puget Sound have long been recognized for their great value to the people of western Washington. Commercial and sport fishing, hunting, and recreational boating contribute hundreds of millions of dollars annually to the region's economy. The waters have been designated "extraordinary," the highest classification possible, by the Washington State Department of Ecology.

Puget Sound is also extensively used by ships. Of particular concern have been tank vessels. As a result of the congested vessel traffic and the concern of local residents over the impact a large oil spill would have on the local marine environment, regulations were passed to first establish a Puget Sound Vessel Traffic Service in July 1974. With only minor modifications, these regulations remain in effect today.

Since March 1978 there has been a restriction on the size of tank vessels that may sail through Puget Sound. An interim navigation rule prohibited the operation of tank vessels in excess of 125,000 deadweight tons in the Sound. This limit was adopted based on studies of probable oil spills and the desire of the area's residents that some action be taken to prevent a large oil spill before an accident occurred.

The final rule, signed by the Secretary of Transportation on April 20, 1982, continues the restriction. Tank vessels in excess of 125,000 DWT are prohibited from entering Puget Sound east of a line extending from Discovery Island Light to New Dungeness Light. This action will continue to provide a high level of protection to the marine environment in the Puget Sound area.

The effective date of the rule was June 10, 1982. For further information, contact Daniel Ziegfeld, U.S. Coast Guard (G-WWM/16), Washington, DC 20593; (202) 755-6146.

Safety Rules on Hazardous Liquids Amended
(CGD 78-128)

The Coast Guard has revised its regulations concerning safety rules for self-propelled vessels carrying hazardous liquids. Editorial changes were made, confusing points clarified, impractical provisions deleted, and a number of new provisions added. The changes adopted are generally in keeping with the standards adopted by IMO, the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization). Included in the amendment is a list of cargoes that are regulated under Part 153 of Title 46 of the Code of Federal Regulations, which includes carriage requirements.

For further information, contact LCDR James W. Gormanson, U.S. Coast Guard (G-MTH-1), Washington, DC 20593; (202) 426-1217.

Changes in Requirements for Foreign-flag Tankers Proposed
(CGD 81-052)

On May 10, 1982, the Coast Guard published an NPRM for the purpose of soliciting public comment on a Coast Guard proposal to revise the rules for self-propelled vessels carrying hazardous liquids and bulk liquefied gases.

In the past, foreign-flag tankers had to obtain a Letter of Compliance to carry hazardous liquids or liquefied gases in U.S. waters. This policy was developed at a time when there were no international standards for chemical and liquefied gas tankers and when there was little operational experience with these types of vessels. Because IMO (formerly IMCO) has since adopted construction and equipment codes, the Coast Guard believes that a complete plan review and a subsequent examination of the constructed vessel are no longer necessary. Under the proposed rule, the special Letter of Compliance would be replaced by the Certificate of Compliance now issued to all foreign-flag vessels carrying oil and hazardous materials in bulk.

For further information, contact LCDR Winston Jones, U.S. Coast Guard (G-MTH-1), Washington, DC 20593; (202) 426-1217.

Consolidation of Licensing/Certification Centers Proposed
(CGD 82-032)

In the past, the licensing and certification of seamen could be done at any Coast Guard Marine Safety Office or Marine Inspection Office. Because of future budgetary limitations, the Coast Guard has proposed that 16 Regional Examination Centers (RECs) be established to perform the licensing and certification. An NPRM to this effect was published on May 3, 1982.

The following locations are being proposed for the 16 RECs:

Boston
New York
Baltimore
Miami
Charleston, South Carolina
New Orleans
Houston
Memphis
St. Louis
Toledo, Ohio
Long Beach, California
San Francisco
Seattle
Anchorage
Juneau
Honolulu

The selection process was based on the availability of existing Coast Guard examining facilities, access to public transportation and lodging, and proximity to maritime academies and approved schools. At least one REC is in to be located in each of the 12 Coast Guard Districts.

For further information, contact CDR Scott D. McCowan, U.S. Coast Guard (G-MVP-5/14), Washington, DC 20593; (202) 426-2240.

Written Warnings to be Issued for Visual Distress Signal Violations
(CGD 82-040)

On May 17, 1982, the Coast Guard published a final rule authorizing the issuance of written warnings for violations of Visual Distress Signal (VDS) regulations. The intended effect of this amendment is to emphasize the educational rather than punitive stance of the Coast Guard regarding enforcement of VDS regulations.

This warning procedure is being adopted because Coast Guard enforcement policy is tempered by an understanding of the problems encountered by the boating public. Coast Guard policy permits the issuance of written warnings for certain violations of boating laws and regulations. These warnings may be issued by the boarding officers who discover the violations. The issuance of a written warning, as opposed to an action for the assessment of a monetary penalty, has been determined to be an effective way for boarding officers to handle minor boating violations that involve first offenders who indicate that discrepancies will be quickly corrected.

There is a specific list of violations for which the boarding officer, at his discretion, may issue a warning. This list is found in Section 1.08-1 of Title 33 of the Code of Federal Regulations. The amendment will extend that list to include Subpart C of Part 175 of Title 33 (Visual Distress Signals). It will authorize the issuance of written warnings to operators of boats not in compliance with Federal regulations for Visual Distress Signals when good faith in bringing about compliance is demonstrated.

For further information, contact William B. Sobeck, U.S. Coast Guard (G-BEL), Washington, DC 20593; (202) 426-1476. ⥿

A Reminder on Inland Rules Date Change

The Coast Guard's Office of Navigation would like to remind our readers once again that the effective date for the new Inland Navigation Rules on the Great Lakes has been changed. Rather than going into effect on July 1, 1982 (as reported in the April 1982 issue of the *Proceedings)*, the Inland Navigation Rules will not go into effect on the Great Lakes until March 1, 1983.

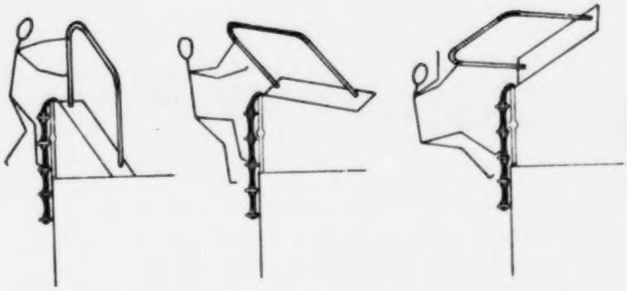
For further information, contact LCDR Kent Kirkpatrick, U.S. Coast Guard (G-NSR-3), Washington, DC 20593; (202) 245-0108.

Pilot Ladder Safety

by Captain Malcolm C. Armstrong, Pilot

Since it was first published in 1980, Malcolm C. Armstrong's book Pilot Ladder Safety *(now in its 3rd Edition) has become an internationally accepted reference work on safe procedures for boarding and disembarking by pilot ladders. It is directed at all individuals who at some time might be required to climb a pilot ladder, to rig one, or to check international requirements. It will also provide guidance to naval architects and shipbuilders with regard to pilot ladder equipment and pilot access points. The book is an illustrated commentary on Chapter V, Regulation 17, of the International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974).* Pilot Ladder Safety *is aimed not only at explaining regulations but at giving those concerned a practical understanding of the intent behind the regulations. An excerpt from the book appeared in the December 1981 issue of* the Journal of the Australian Institute of Navigation. *The following article is adapted from that excerpt.*

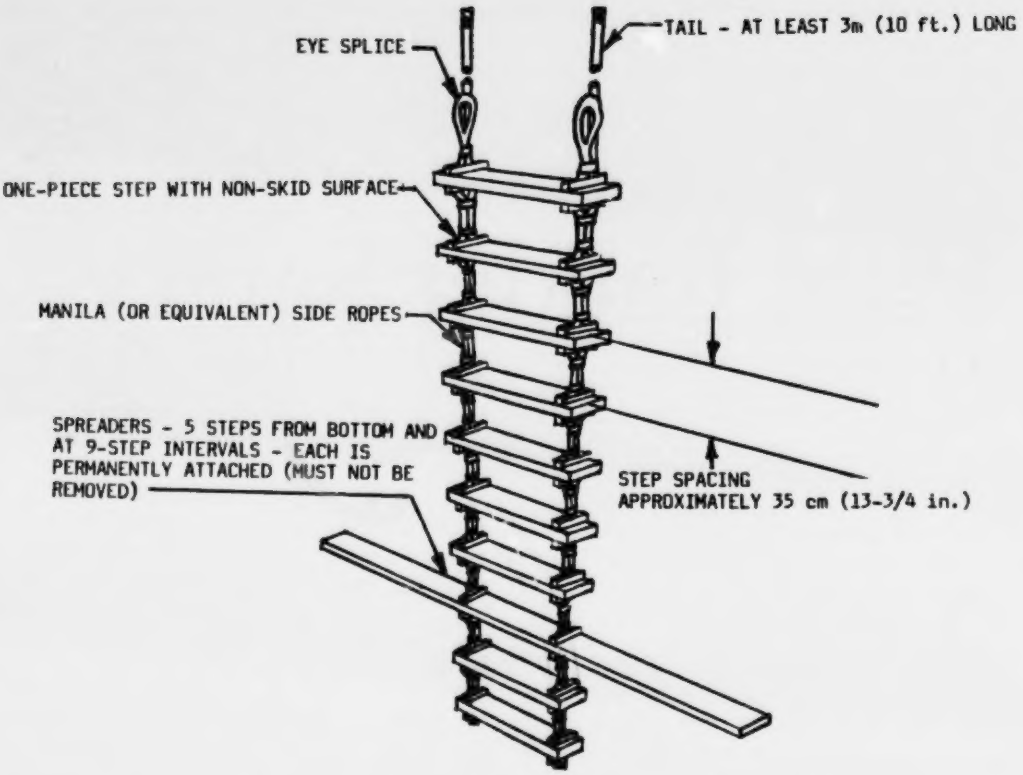
An Australian customs officer boarding a small ship in the port of Sydney was thrown back onto the deck of his launch when the bulwark ladder came loose and flipped over. As shown in the illustration above, the accident occurred because the bulwark ladder was not secure and there were no bulwark stanchions for him to hold when passing over the bulwark. These stanchions are as important as the pilot ladder itself; SOLAS regulations specify correct length, thickness, and fitting. Even so, stanchions are often neglected or badly made.



An insecure bulwark ladder and the absence of stanchions can lead to a bad accident.

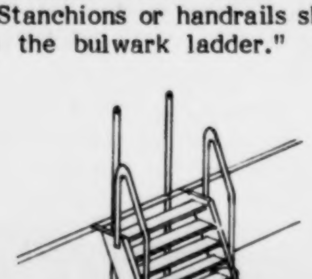
A more recent Australian fatality occurred when a pilot at a Queensland port fell from the top of the pilot ladder to the deck of the pilot vessel. As in the case just described, the bulwark ladder fell over the side with him.

Captain Armstrong is a practicing pilot at the Australian ports of Sydney and Botany Bay and is a member of the technical committee of the International Maritime Pilots' Association. He was vice president of the Association from 1974 to 1978 and was elected an honorary member in 1978. In 1981 he was elected a Fellow of the Australian Institute of Navigation. In addition to writing and publishing Pilot Ladder Safety, *Captain Armstrong has written* Practical Ship Handling, *published in Scotland by Brown, Son & Ferguson Ltd.*


EYE SPLICE
TAIL - AT LEAST 3m (10 ft.) LONG
ONE-PIECE STEP WITH NON-SKID SURFACE
MANILA (OR EQUIVALENT) SIDE ROPES
SPREADERS - 5 STEPS FROM BOTTOM AND AT 9-STEP INTERVALS - EACH IS PERMANENTLY ATTACHED (MUST NOT BE REMOVED)
STEP SPACING APPROXIMATELY 35 cm (13-3/4 in.)

TYPICAL COAST GUARD-APPROVED PILOT LADDER

The illustration below shows a bulwark ladder secured to the ship; proper stanchions are fitted. A man rope, at least 2½ inches but preferably 4 inches in circumference, should be rigged from the top of each stanchion so that the pilot can grasp the ropes when climbing up or down without holding the pilot ladder (some pilots choose not to use man ropes, but it is nevertheless a requirement that man ropes be supplied). It is interesting to note that the British Government Pilot Ladder Regulations state that "Stanchions or handrails shall not be attached to the bulwark ladder." Some bulwarks are so high that handrails are essential, but the British regulations emphasize the fact that bulwark stanchions must be quite separate from the bulwark ladder.



Bulwark ladder and stanchions must be independently secured to the ship.

Every pilot who uses substandard equipment is endangering his fellow pilots. In darkness and bad weather it is sometimes difficult for him to detect deficiencies before stepping on the ladder, but all deficiencies should be reported and corrected as soon as they are noticed. Ships' personnel who seldom, if ever, climb a pilot ladder may not be aware of the hazards involved and do not always pay sufficient attention to detail even if they are aware of the SOLAS regulations; a few words of explanation can usually set them straight.

The choice of material used in the assembly of pilot ladders is extremely important. A decline in the amount of good-quality fiber being grown for making manila rope has led to the manufacturing of poor grades of rope. SOLAS regulations state "manila," but they do not state "first-grade manila." Lower grades of manila are being used, and these are not only inferior in strength and durability but are very rough and uncomfortable to hold in the hands.

The SOLAS Convention allows alternative materials to be used if they have properties equivalent to those of manila and are approved by a country's government. Alternatives should be approved only after careful consideration and thorough testing. An excellent polyester rope has been developed especially for pilot ladder construction and has been used in one ladder approved by the U.S. Coast Guard. This rope is far superior to manila in strength, durability, resistance to sunlight and chemicals, water absorption, and touch, and it has a colored core which serves as a warning if the rope is damaged. However, there are many synthetic ropes which are quite unsuitable for pilot

In May 1980 the International Convention for the Safety of Life at Sea, 1974 (SOLAS 1974) came into force. With it came a complete revision of the requirements for pilot ladders and pilot boarding arrangements. U.S. vessels, as well as vessels registered in other countries that have ratified SOLAS 1974, must comply with these new requirements. The requirements are found in Chapter V, Regulation 17, of SOLAS 1974. The following is a summary:

- The pilot ladder must have a number of required features. For U.S. vessels, this means that a vessel must use a Coast Guard-approved pilot ladder that has an approval number on the bottom of each step that begins "163.003/. . ." The old style of approved ladder with two-rung steps does not meet the requirements. Some of the important features of the Coast Guard-approved SOLAS 1974 ladder are shown in the figure on the preceding page.

- The rigging of the ladder as well as the boarding and disembarking of the pilot must be supervised by an officer of the vessel.

- The ladder must be secured so that each step rests firmly against the side of the vessel and in a location away from overboard discharges.

- The ladder must be arranged so that the pilot can board the vessel or an accommodation ladder leading to the point of access to the vessel after climbing at least 1.5 meters (5 feet) but not more than 9 meters (30 feet).

- Where access to the vessel is by means of a gate in the rail or bulwark, handholds must be provided.

- Where access to the vessel is over the bulwark, a bulwark ladder must be provided which is securely attached to the bulwark rail or platform. Two handhold stanchions at least 40 mm. (1½ inches) in diameter must be provided on either side of the point of access spaced 0.7 meters (27 inches) to 0.8 meters (31 inches) apart and extending at least 1.2 meters (47 inches) above the top of the bulwark. The stanchions must be secured to the vessel structure at the base and also at a higher point.

- Two man-ropes at least 65 mm. (2½ inches) in circumference must be secured to the vessel at the pilot ladder and kept ready for use, along with a safety line (heaving line).

- At night, lighting must be provided over the side, and a lifebuoy with attached water light must be kept at hand.

- The pilot ladder must be kept clean and in good order.

- Broken pilot ladder steps must be replaced with permanent replacement steps as soon as possible. Approved replacement steps will be available from the manufacturer of the ladder and are to be attached to the ladder in the same manner as the original steps. Temporary replacement steps secured in a manner different from the original construction may be used as long as there are not more than two in the ladder.

- If a powered pilot hoist is used, it must be identified as Coast Guard-approved. A pilot ladder must be provided on deck adjacent to the hoist, ready for immediate use. This ladder is provided in case the pilot hoist fails. Also, many pilots prefer not to use powered pilot hoists.

ladder construction. Polypropylene rope develops burrs or whiskers which are sharp and dangerous; nylon is slippery and too elastic.

The timber used for making pilot ladder steps is often of dubious quality. Steps are often made, for example, of green timber that warps, cracked timber, or timber with splinters. These are not only dangerous to the pilot but also to the people rigging the ladder. Pilots and ships' personnel should reject any ladder that is inferior, even if it appears to have been assembled in accordance with regulations.

Synthetic material is permissible in lieu of hardwood if it has equivalent relative density, strength, durability, and buoyancy. Aluminum is not permissible, although it is used on some ships and is favored in arctic conditions because it can be more easily freed from ice.

U.S. Coast Guard rules require that each step and the ladder as a whole be able to withstand 2,000 pounds. Although there is no pilot who weighs in at 2,000 pounds, it is possible that a strain that great might be put on the ladder if it gets caught between ship and pilot vessel. It is important not only that the steps be strong but also that they be well secured to the side ropes. Marline seizings work loose and rot and take a long time to replace. It is likely that a more permanent method of securing the steps will supersede the old system. [The new U.S. Coast Guard pilot ladder regulation prohibits the use of marline seizings.]

When a pilot is climbing a ladder, it is important that he be able to keep the same rhythm all the way up. Therefore, all steps must be equally spaced. It would also be helpful if the spacing between steps and the clear space between side ropes were standardized for all ladders. Within the range allowed by the SOLAS regulations there can be a wide variation from one ladder to another. The 3rd Edition of *Pilot Ladder Safety* includes an illustration with suitable measurements as a guide for makers of pilot ladders.

Pilot hoists should be mentioned here because they are still being manufactured and fitted. They are optional extra equipment and in no way relieve the ship of any of the requirements regarding pilot ladders. The International Maritime Pilots' Association and the American Pilots' Association discourage their use, and the European Maritime Pilots' Association has asked its members to refuse to use hoists. Many pilots decline to use them at any time.

Excessive height from water line to point of access is a serious problem for pilots. The maximum allowed by SOLAS is 9 meters (30 feet). There is a feeling among pilots that this maximum should be reduced to 7 meters (23 feet). There are many ships in which the height exceeds 9 meters; often it is exceeded only marginally and is not considered important by people who do not actually have to climb the ladder. The number of ships on which this height restriction becomes important has increased considerably in the last few years as the number of tankers, other bulk carriers, vehicle carriers, and container ships has grown.

The solution to the height problem is simple—perhaps easier said than done, but not impossible with today's technology. Very large passenger ships have been around for as long as most people can remember, and there are no ships afloat today that are any higher than the largest of passenger ships. These ships have always been boarded through doors in the side; the same method could be used on any large ship if the effort were made in the design and building stages. On some ships, side doors have been fitted for engine room access or bunkering attachments (the pilot is still expected to go 20 meters up the ship's side). Fitting a door in the side for the pilot is simply a matter of cost, ingenuity, application, and—most significantly—priorities. The pilot's job is to look after millions of dollars' worth of ship; how much is the shipowner prepared to spend on the safety of the pilot?

A side door for pilot access must open inward and must be placed so that it is neither too high nor too low. The International Maritime Pilots' Association has drawn up guidelines on this matter. At least one shipowner in recent years has disregarded these guidelines; he spent many thousands of dollars on side doors only to find that they were rejected by pilots because they opened outward and were so placed that they were a serious hazard to anyone on the deck of the pilot vessel. These doors have now been sealed and alternative boarding arrangements fitted. It is important to have prior consultations with the right people before fitting new equipment.

SOLAS regulations allow the use of an accommodation ladder in conjunction with a pilot ladder. This system is often used on large ships. The ship's regular accommodation ladder may be used if it is amidships and leads aft, or there may be a short accommodation ladder installed solely for use with the pilot ladder.

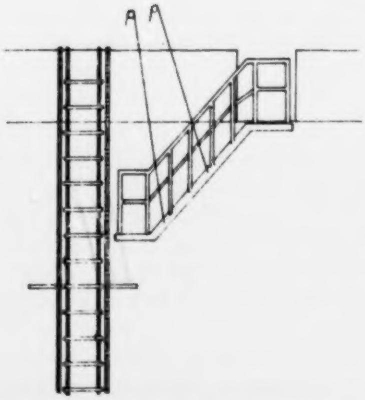
The accommodation ladder platform must be high enough to be clear of the pilot vessel's superstructure and clear of the heads of crewmembers on the pilot vessel's deck; it must be held firmly against the ship's side so that it does not swing outward with the rolling of the ship. In Australia the pilot ladder and man ropes must also be held into the ship's side if they extend more than 2 meters above the platform. The author recommends that this policy be followed in all cases; otherwise, the ladder and man ropes pendulate away from the ship's side and make climbing all the more difficult. IMCO* Resolution A.426(XI) sets out most of the requirements for the safe rigging of an accommodation ladder when it is used in conjunction with a pilot ladder. *(See text at end of article)*

The illustration to the left below shows an accommodation ladder rigged close to a pilot ladder. If the pilot ladder is suspended from the platform, the lifting wires must be connected to the platform and give direct support to the pilot ladder. Such a system requires very careful design and construction to be safe. It would be dangerous to hang a pilot ladder from the accommodation ladder unless the pilot ladder were also supported independently from the deck. The illustration on the right shows the Welin pilot platform system, which has been designed especially for pilots and has proved to be very safe and convenient. The pilot ladder hangs from the platform, and there is a suspension wire from each corner of the platform. The pilot climbs through the platform.

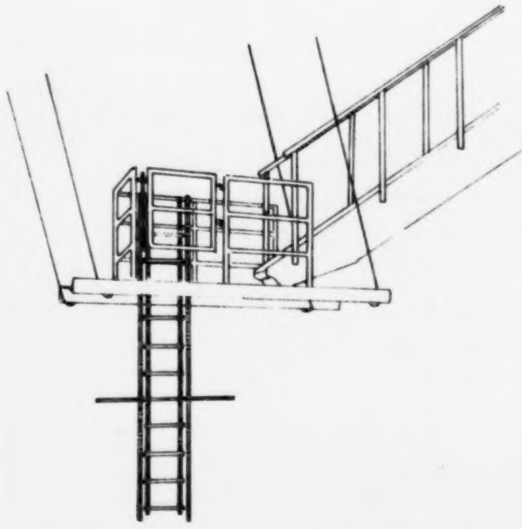
Proper facilities for boarding and disembarking must be provided on every ship that may ever take a pilot—and that means virtually every ship that floats. Facilities must be on both sides. There is no valid excuse for not providing proper boarding arrangements, but there are many ships which fail to do so and there are many ships which consider it sufficient to make the provision on one side only. This is contrary to international regulations and shows a lack of consideration for the safety of pilots. In 1975 IMCO passed a resolution calling on governments "to ensure the provision of a safe means of embarking and disembarking pilots in all vessels, including those whose size, design, or function incorporates unusual features, by a critical examination in the early design stages of the plans and facilities proposed." It is quite clear that many people in ships, shipyards, and shipping company offices are not aware of this Resolution (A.331(IX)).

There are many seagoing tugs, ferries, and fishing vessels that regularly take pilots whose boarding arrangements are, in some cases, nonexistent. On small vessels it may be necessary only to fit stanchions, man ropes, and a short ladder, but there must be safe and convenient access.

Pilot ladders in use on U.S. ships until recently were considered by most pilots to be



Pilot ladder rigged adjacent to accommodation ladder.



Pilot platform with accommodation ladder.

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* Editor's note: IMCO, the Inter-Governmental Maritime Consultative Organization, changed its name to IMO, the International Maritime Organization, on May 22, 1982.

far from satisfactory. Among the common faults were steps made from two or more pieces of wood, ladders made from two or more separate lengths shackled together, steps of different widths in the same ladder, side pieces so large that it was almost impossible to get a hand around the side ropes, and spreaders lashed between steps instead of being integral with the steps. A new American pilot ladder known as the COMAR Mark I is, in the opinion of the author, probably the best pilot ladder in the world and has been developed in close consultation with pilots to satisfy their requirements.

Shipowners and masters will find it wise to buy good-quality pilot ladders that will last a long time with little or no maintenance rather than poor-quality ladders that may not even see them past the first port. Pilots should not be expected to risk their lives on substandard equipment.

Captain Armstrong's book, Pilot Ladder Safety, *complete with explanations of SOLAS regulations and the recommendations and requirements of IMO (formerly IMCO) and the International Maritime Pilots' Association, can be purchased for $3.00, including postage, from:*

Coast Marine & Industrial Supply, Inc.
398 Jefferson Street
San Francisco, CA 94133

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The text of the Annex to IMCO Resolution A.426(XI),

"RECOMMENDATION ON
ARRANGEMENTS FOR
EMBARKING AND DISEMBARKING
PILOTS IN VERY LARGE SHIPS,"

reads as follows:

1. In all ships where the distance from sea level to the point of access to, or egress from, the ship exceeds 9 metres, and when it is intended to embark and disembark pilots by means of the accommodation ladder in conjunction with a pilot ladder, the ship should carry an accommodation ladder on each side, unless the accommodation ladder is capable of being transferred.

2. The ladder should be sited leading aft. When [the ladder is] in use, the lower end of the ladder should rest firmly against the ship's side within the parallel body length of the ship and within the mid-ship half section and clear of all discharges. Equally safe arrangements which might be more suitable for special types of ships should be acceptable.

3. The length of the accommodation ladder should be sufficient to ensure that its angle of slope does not exceed 55 degrees.

4. The lower platform of the accommodation ladder should be in a horizontal position when [the ladder is] in use.

5. Intermediate platforms, if fitted, should be self-levelling. Treads and steps of the accommodation ladder should be so designed that an adequate and safe foothold is given at the operative angles.

6. The ladder and platforms should be equipped on both sides with stanchions and rigid handrails, but if handropes are used they should be tight and properly secured. The vertical space between the handrail or handrope and the stringers of the ladder should be securely fenced.

7. The pilot ladder should be rigged immediately adjacent to the lower platform of the accommodation ladder and the upper end should extend at least 2 metres above the lower platform.

8. Lighting should be provided at night such that the full length of the ladder is adequately lit.

9. If a trap door is fitted in the lower platform to allow access from and to the pilot ladder, the aperture should be not less than 750 x 750 mm. In this case the after part of the lower platform should also be fenced as in paragraph 6, and the pilot ladder should extend above the lower platform to the height of the handrail.

10. Accommodation ladders, together with any suspension arrangements or attachments, fitted and intended for use in accordance with this recommendation, should be to the satisfaction of the [government of the country of registration]. ‡

There's a new source of power in the wind

by William McCloskey

Within the enclosed compound of the Cape Henry (Virginia) light station, in a clearing protected by sand dunes from the direct assault of the ocean, stands a very important 60-foot tower. The tower is part of a project being conducted by the Johns Hopkins University Applied Physics Laboratory (APL) for the U.S. Coast Guard. Its goal: to test a prototype wind machine that can provide at least 50 percent of the energy needed for operating a lighthouse. The test is part two of a four-phase APL/Coast Guard project designed to find an alternative to diesel oil for powering remote, unmanned facilities.

Cape Henry lighthouses have been guiding Atlantic Ocean mariners into the mouth of the Chesapeake Bay since 1792. The U.S. Coast Guard mans the Cape Henry station, providing not only a nightly flashing beacon and a fog signal when needed but also marine radio and weather monitoring of the area. The present vertical black-and-white striped tower—170 feet high and visible at sea for 19 miles—has itself been a landmark since it was built in 1881 to replace the original lighthouse, which still stands as a historical monument.

It is a simple matter to drive straight to the door of the Cape Henry light station from either Norfolk or Virginia Beach. Many of the other more than 200 U.S. lighthouses, however, are surrounded by miles of water, rock, or other forms of wilderness. Reaching them can be a problem.

I can recall my own experience as a young

Cape St. Elias, Alaska, 1952, before the days of automation: except for the mail and equipment that was air-dropped to the four men living at the station, all supplies had to be brought in by small craft over a treacherous shoreline. Photo copyright © William McCloskey

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William McCloskey, a staff member of the Johns Hopkins University Applied Physics Laboratory, is the author of Highliners *(McGraw-Hill, 1979 and 1981), a documentary novel about fishermen (and Coast Guardsmen) in Alaska. He was once a line officer in the U.S. Coast Guard, stationed aboard the cutter SWEETBRIER in Alaska.*

Coast Guard officer during the early 1950s. The ship on which I served once had to wait three weeks off the Cape St. Elias light station in Alaska before the sea became calm enough for us to deliver winter supplies and fuel through the surf for the four men stationed there. Less dramatic were the times we routinely waited off the remote Alaskan stations at least a day or two after our arrival until landing conditions became safe enough for us to bring in a boat. The delivery itself was a wet and occasionally dangerous trip. We would steer a small boat through water that surged against boulders, then either scale the cliffs, shouldering heavy boxes over tide-exposed slippery rock and in hip-deep icy surf, or land through the surf. We pumped fuel ashore from a special barge that we anchored in as close as possible. Two engineering chiefs tended the barge, shivering for hours on its slick deck despite their thermals and oilskins.

The Coast Guard found it difficult to keep men at these stations--and increasingly expensive. A decade ago it began to automate the stations, as the technology became available to operate the lights without constant maintenance, to provide radio signals from more accessible locations, and to monitor weather by satellite.

At this point, the most remote light stations (including those in Alaska) have been automated, although the Coast Guard will not be able to complete its automation program for a few more years because of budgetary constraints. Modernization has already brought dramatic changes to the life of a Coast Guard "wickie" (old Coast Guard slang for a lighthouse keeper). Recently I rode with the Coast Guard aboard an H-3 helicopter out of Kodiak, Alaska, to service the Cape St. Elias light station 150 miles away (the station I remembered so vividly from a quarter century before). We left after breakfast, crossed the rough Gulf of Alaska, looking below at whitecaps on the water, landed close to the breaking surf on a new helo pad beneath the lighthouse, transferred fuel, checked the generator, light, and fog systems, even wandered briefly through the boarded up and deserted living quarters, and made it back to Kodiak in time for dinner.

The automated stations receive power from either submarine cables or diesel generators. Most of the approximately 65 stations on diesel, like the Cape St. Elias station, are supplied by helicopter—an expensive process even on stations now free of occupants and on those where various efficiencies have been introduced. There is no question that a natural source of energy would reduce the cost of operations still further.

For the past three years APL has been investigating for the Coast Guard ways to improve the efficiency and performance of aids to navigation which are frequently inaccessible. In a feasibility study completed last September, APL proposed networks of solar-powered aids

Says Dean Scribner, the Coast Guard's project officer for alternate power sources at lighthouses:

"In energy planning and analysis, the bottom line is economics. At remote lighthouses, this includes reducing the amount of diesel fuel consumed by as much as possible as well as reducing servicing costs. Ultimately, as many as 50 to 100 lighthouses could conceivably be converted to alternate energy sources. Therefore, we are very interested in the technical aspects and associated costs of alternate power sources used at lighthouses.

"The APL study shows that 87 percent of the lighthouses currently powered by diesel generators might be able to operate at 14 - 25 percent of their present costs. All of these lighthouses are in regions where strong winds prevail. In general, we have found that, in the U.S., wind machines are more economical than solar cells for all except the southern onshore lighthouses. This is not surprising in view of the nature of the earth's wind patterns in the northern hemisphere. The average wind speeds tend to increase with increasing northern latitude in the coastal and offshore regions. Thus, the average wind speeds measured along the coast of Maine are significantly greater than those along the coast of Florida. In the immediate vicinity of the coastline there is usually a sea breeze blowing toward the shore during the day and away from the shore during the night.

"Many of the remote lighthouses are located on offshore islands. In these locations there are no surface obstructions as there would be over land surfaces, and wind velocities tend to build up to much higher speeds."

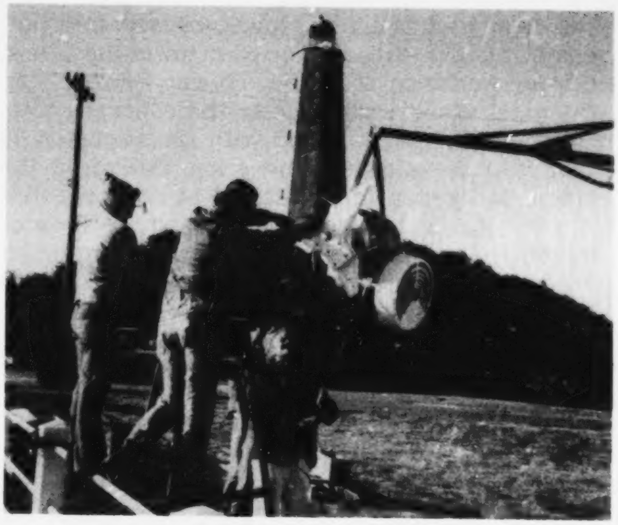
to navigation linked by conventional VHF radio or by satellite. The microprocessor data system would feed into a shore-based computer. The computer would synchronize flash patterns for better recognition within a group of buoys, report the daily operational status of each buoy (whether it was on station and functioning), and, in the event of a malfunction, provide diagnostic information for a maintenance crew.

The Cape Henry wind machine project is part of a longer-range study. Under the direction of engineer Dick (William R.) Powell, the APL team is investigating energy sources that could be used as an alternative to diesel oil to provide a steady supply of storable energy for large navigational aids. Phase One of the project was a feasibility study to determine the most universally applicable and economical energy the Coast Guard could use. This study resulted in a recommendation to investigate wind power. Solar photovoltaic arrays have proven successful for powering lighted buoys in southern waters. However, solar does not appear to be a practical means of delivering the volume of energy needed for the high-load fog signals and strong night beacons required of a lighthouse—particularly one located in an area of frequent fog, overcast skies, and storms.

Phase Two, now underway, involves testing the prototype wind machine at Cape Henry. The year-long project will involve monitoring, data collection, hardware testing, and initial work to develop the controls of an integrated system combining diesel power and wind power. The goal of Phase Three is a thoroughly engineered system which can be replicated. In Phase Four the equipment will be placed in a design form that can be manufactured economically.

To begin Phase Two, the APL team first designed the wind machine test, then assembled the components at its facilities in Howard County, Maryland. The propeller blades and the generator were fitted to the tower's dimensions, and the initial conditions of the wind machine were carefully measured. Also being developed was the equipment that would load, control, and monitor the wind machine. The wind machine itself had been developed by North Wind Power Company for the Department of Energy, while APL had designed the test and built the ground equipment.

Erection of the wind machine at Cape Henry took place last October. A month earlier, the APL group had supervised the pouring of a six-foot deep concrete platform. Such a depth was considered necessary to keep the tower stable in sand.



The generator portion of the wind machine is hoisted to a mount prior to the machine's installation atop the 60-foot tower. In the background is the original Cape Henry lighthouse, now a historical monument.

On the morning of the big day, groups assembled from the Coast Guard, APL, North Wind, and Bay Tower (which erected the tower). A chilly breeze blew in from the ocean. (Had the breeze been stronger, it would have been necessary to postpone the raising of the tower.) A crane was towed in to hoist the 60-foot tower, which lay on its side in the sand. An APL truck drove up with the wind machine, which a North Wind/APL team carefully unpacked, lowered to the ground, and assembled. The sun glinted on the varnished wooden propeller blades being bolted to the hub, as the long shadow cast by the 170-foot-high lighthouse loomed alongside.

Along the horizontal tower of cross-hatched steel struts, APL meteorologist James Meyer affixed a series of corrosion monitors. He had placed similar displays of the two-inch square steel plates at various heights outside the lighthouse, in locations where they could be reached through windows off the spiral inner stairs. Periodic checks on corrosion from the salt air and abrasion from blowing sand at a variety of heights will help predict the effects of weathering on wind machines erected at the sites of specific lighthouses.

Erecting the tower took all day. It included a wait while a crewman from a Coast Guard helicopter calibrated the station radio beacon so that we would have a basis for correction if the new wind machine tower caused interference. (It did not.) Once the tower had been raised, workmen from Bay Tower bolted it to the steel shafts embedded in the concrete platform. Then they climbed with the workmen 60 feet into the air, and the crane delivered the assembled generator, followed by the propeller mount. It required some fitting and on-the-spot modification, but everything went smoothly. When the workmen needed a tool or part, they lowered a bucket for it. In late afternoon, the propellers began to turn and register a charge on the monitoring equipment below. Everybody gave a cheer.

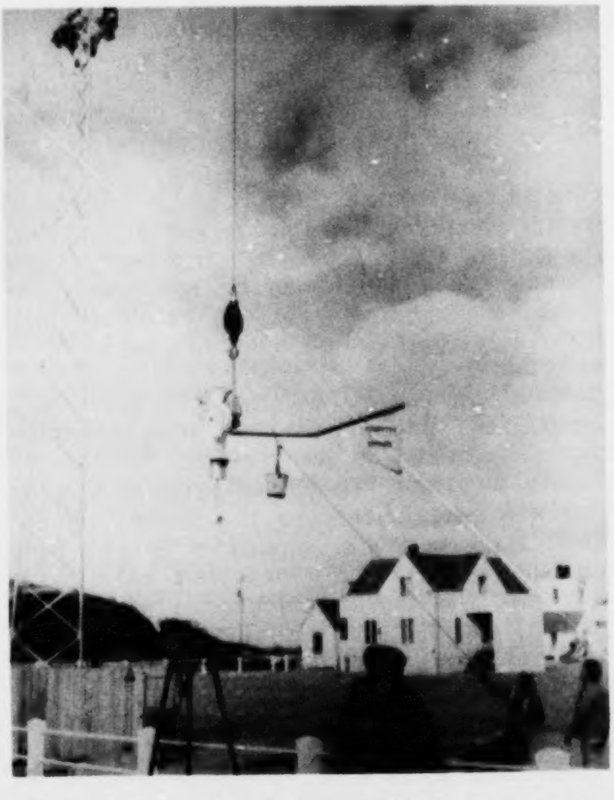
The propellers are built so that they will tilt back on a coil spring if the wind reaches too great a velocity. Tilting slows them down and prevents either an overcharge of power into the system or damage to the blades.

The wind machine can generate 2½ kilowatts of power in a 30-miles-per-hour wind. A sudden strong wind can push this to 4 kilowatts for a second or two before the propellers tilt. The mechanical energy generated by the turning propellers is converted within the wind machine into a form of three-phase AC power. A set of rectifiers converts this into DC power, which is transmitted below to a charging circuit which both controls the current and allows the monitoring of the load placed on the wind machine. Following the test period, electricity will be stored in batteries, where it changes into chemical form. The chemical energy changes back into DC energy, which can be used directly for some purposes—the fog horn power supply, for example. However, most of the Coast Guard load applications require AC power, which must be supplied from the batteries through an inverter.

While the Cape Henry light station is manned by several Coast Guardsmen (some living with their families in the compound), the wind machine is an independent project which involves them only in the event of an emergency. For the next year, the APL team plans to visit the machine periodically to collect recorded data and experiment with feeding different load increments into the system.

The wind machine, Dick Powell points out, is still only a prototype. The data it provides will be fed into a mathematical computer simulation model back at APL. The model will be able to calculate the relations between energy stored in the batteries and other energy being used directly. This will help determine the times when the back-up diesel power must be used at an actual light station and when it can be shut off.

Wind energy for U.S. lighthouses, if the APL project for the Coast Guard proves to be a success and becomes operational, will represent one more step in a long evolution of power sources. Records of the old Cape Henry lighthouse show that a wick lamp burning fish oil provided the initial mariners' light in 1792. Fuels improved over the years--sperm oil, colza oil, lard oil, and finally kerosene after the discovery of petroleum in 1859. When the present tower began operation in 1881, the lantern had a "first-order lens" with five concentric wicks. Other new features included a steam siren fog signal. In 1912 an incandescent oil-vapor lamp burning kerosene vapor replaced the wick lamp. This improvement increased the light's candlepower from 6,000 (magnified from the light source by the lens) to 22,000. The present Cape Henry light has 80,000 candlepower. How much of it can be powered by wind remains to be seen, but the outlook, after a few months of propeller blades turning atop the new 60-foot tower, appears good. ⚓



Riggers atop the 60-foot tower prepare to install the wind machine being lifted by crane. The attached bucket was used to lower the tools or other equipment they needed.

Pairing "Schoolships" with Scholarship:

SUNY Maritime College

The State University of New York Maritime College at Fort Schuyler has played a prominent role in the development of maritime education and training since its very inception in 1874. The college owes its start to a gentleman named Stephen B. Luce.

Luce, who later became an admiral in the U.S. Navy and founded the Naval War College, was concerned about the poor quality of many of the men with whom he served in the Union Navy during the Civil War. After the war, he developed a plan for a training program for future merchant marine officers. His program included "schoolships." Luce's "schoolship" concept was based on the principle that simply working on a ship did not constitute adequate training. He felt that seaman needed academic instruction as well as practical, sea-going experience.

Thanks to Luce, the Morrill Act of 1862 (which established the land-grant colleges) was extended in 1874 to include nautical education. The "Marine Schools" Act of June 20, 1874, passed by Congress to "promote nautical education," authorized the Navy to loan the states ships to be used for public marine schools. The sloop-of-war ST. MARY'S was fitted out under Luce's personal supervision and opened as the New York State Nautical School on June 11, 1875. Luce also wrote a textbook for the students, *The Young Seaman's Manual.*

The Maritime College campus is located at Fort Schuyler on the historic Throgs Neck of the Bronx, New York. Photo by Robert Hogg

In 1913 the school became the New York State Merchant Marine Academy, and in 1938 it moved to its permanent campus ashore (the newly renovated Fort Schuyler on the Throgs Neck in the Bronx). In 1948 the state legislature passed a bill creating the State University of New York. At that time the name of the school was changed to the State University of New York Maritime College. It today offers fully accredited baccalaureate degree studies in nine different academic majors combined with preparation for licensure as either a deck or engineering officer in the Merchant Marine. A Master of Science degree program in Transportation Management is also offered.

As it has evolved, the "schoolship" concept has retained the all-important aspects of training and instruction at sea. And, as ships and industry functions have become increasingly sophisticated, the Maritime College has expanded its curriculum to meet the growing need of the industry for well-educated professionals.

The curriculum paths fall into two major groups: deck license and engineer license. Deck license candidates can pursue majors in either Marine Transportation (with the option of further specializing in either management or economics) or Meteorology and Oceanography. Engineer license candidates have their choice of Marine Engineering, Naval Architecture, Nuclear Science and Engineering, or Ocean Engineering. Computer Science and Electrical Engineering majors are available to cadets preparing for either type of license.

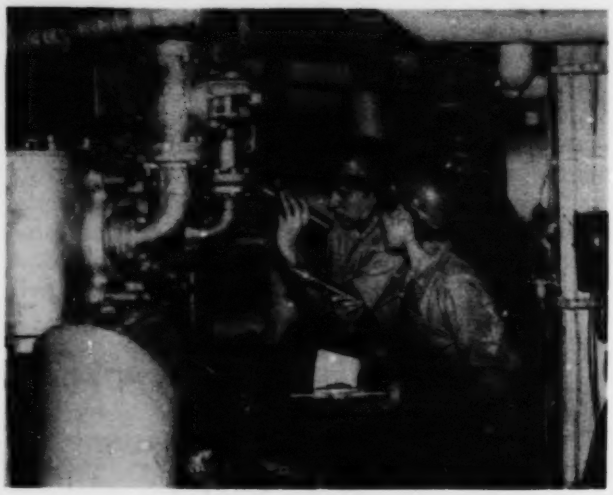
Students prepare for licensing as either a Third Mate—oceans unlimited or Third Assistant Engineer—unlimited horsepower (steam and motor). Electrical Engineering, Marine Engineering, and Naval Architecture degree programs are accredited by the Accrediting Board for Engineering and Technology. All engineering degree programs are recognized for professional engineer (PE) license purposes by the State of New York.

Boatswain George Pontine, with his 40 years' experience, instructs cadets in the art of marlinspike seamanship. Photo by Hugh Rogers

Intensive studies during the students' time at sea reinforce hands-on experience. The controlled experience of a schoolship sea term makes it possible for the seaman to be exposed to situations and techniques which regular ship personnel might encounter only once in a career. During the first of three two-month training cruises (six months of schoolship sea time is required for eligibility to sit for a Coast Guard license), cadets take on the responsibilities and work of an entry-rating employee (ordinary seaman or wiper) in the deck or engine department. During the second sea term, cadets are expected to perform at the Able Seaman or QMED fireman/watertender/oiler level of competence. The third or "First Class" cruise requires cadets to meet the responsibilities of junior third mates or third assistant engineers in both watchstanding and maintenance. All cadets are intimately involved with ship's maintenance as well as operations. Foreign port calls provide rest and relaxation and a glimpse of one of the most rewarding sides of the seafaring profession.

Students rate the sea term among their most rewarding and satisfying experiences. Cadet First-class John Dabbar, of Bartelsville, Oklahoma, praised his sea terms as "a chance to put my book knowledge to use and to develop my practical operating skills." Cadet First-class Susan Farmer, of Ocean, New Jersey, called her hands-on experience "far more interesting and productive than any single course I have taken." Cadet Third-class Edward A. Yeats, of Lexington, Kentucky, pointed out that demonstrating operational knowledge was not enough: "capabilities of leadership and responsibility . . . are expected above all." The other cadets seconded him in praising the sea term as a time to both witness leadership and exercise their own leadership abilities.

If there is any criticism to be made of "schoolship" sea time, it is that cadets do not get the true "feel" of modern merchant ship operations—the awesome sense of responsibility of being the only person on the bridge, the intensity of some in-port operations, the quiet of a ship with 40 crewmembers rather than hundreds, supervision of cargo operations, etc. These are things which are experienced by the cadet when he or she sails as a cadet observer.



Engineering cadets review operation of the fuel oil transfer system in the engine room in preparation for "floorplate" exams. Photo by Hugh Rogers

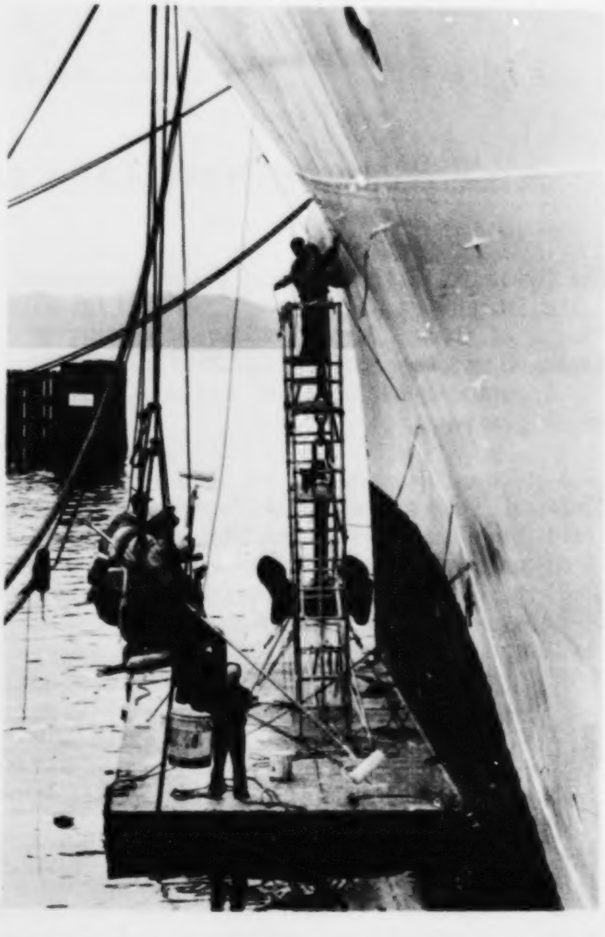
New York Maritime cadets apply for cadet shipping during Christmas and summer vacation periods. Industry support for this mutually beneficial cadet shipping is excellent.

College faculty and staff who possess both professional and academic credentials form the nucleus of the schoolship staff. They develop curriculum, conduct courses, supervise watches, and conduct "floorplate" exams—the grueling oral exams conducted one-on-one between instructor and student in the engineering spaces and on the bridge; these are especially true indicators of a cadet's understanding of systems and situations.

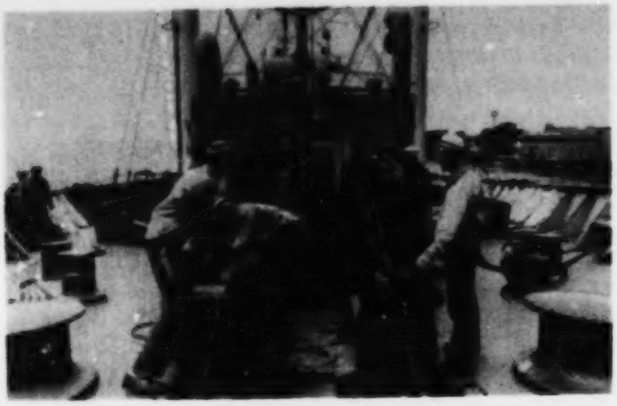
The college's 56-acre campus at Fort Schuyler contains an extensively equipped science and engineering building, a student activities building/boathouse, a physical education complex, dormitories, and dining halls in addition to the renovated Fort building which houses classrooms, the library, and administrative offices. While the students, who are organized as a Regiment of Cadets, do not have a great deal of extra time for a traditional college social life, many participate in such activities as sports, clubs, religious and professional organizations, publications, and band.

The 930 cadets enrolled during the 1981-82 academic year came from 30 different states and 18 countries. The enrollment of women (there are presently 68 women at the college) and American students of minority descent is strongly encouraged, but the Admissions Office reports that the number of cadets from these groups is still disappointingly low.

The vast majority of Maritime College graduates sail on their licenses in the Merchant Marine when opportunities exist. During periods when sea-going positions are scarce, as in the early to mid-1970s, shoreside positions as professional staff members in various areas of the marine industry are sought. In addition, all graduates are eligible for commissioning as an officer in the Navy, Coast Guard, and the Commissioned Corps of the National Oceanic and Atmospheric Administration. Many pursue graduate or other professional studies (the most common is law). This is often accomplished during vacation periods while sailing. The college estimates that 90 to 95 percent of each graduating class is initially associated with the marine industry or pursues a career in Federal service. An estimated 75 percent make their



Preparing for the summer sea term: deck cadets are responsible for hull maintenance, including the never-ending chipping and painting. Photo by Hugh Rogers



Deck cadets do maintenance work on the ground tackle and anchor windlass. Supervisors are first- or second-class cadets, depending on the nature of the work to be done. Photo by Hugh Rogers

careers in one or more areas of the marine industry.

The State University of New York Maritime College has been preparing professionals for the marine industry for over 100 years. From its beginnings on a specially fitted-out sloop-of-war to its present position as an educational institution with fully accredited degree programs, the college has sought to provide the type of well-rounded maritime education envisioned by Stephen B. Luce.

Inquiries concerning the college or its programs should be directed to:

Office of Admissions
State University of New York
Maritime College
Fort Schuyler, Bronx, NY 10465
(212) 892-3000

An Update on Navigation and Vessel Inspection Circulars

The following Navigation and Vessel Inspection Circulars have been published since our last update in the December 1981 issue. They can be obtained free of charge from local OCMIs (Officers in Charge of Marine Inspection) or by writing or calling Commandant (G-MP-4/14), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-2163.

A comprehensive list of available NVCs will be published in the December 1982 issue of the *Proceedings*.

10-81	Coast Guard Certification and Inspection of Certain Categories of Existing Vessels
11-81	Renewal of Deck Officers' Licenses
12-81	Operators' and Motorboat Operators' Licenses
13-81	Recall of Smith & Wesson Line Thrower Rockets
14-81	Stability Tests; Waiving of for "Sister Vessels"
15-81	Guidelines for Conducting Stability Tests
1-82	Acceptance of Certificates of Admeasurement Issued by the American Bureau of Shipping (ABS)
2-82	Letter Form Temporary Certificate of Identification/Service
3-82	Use of Underwriters Laboratories Listed Fire Extinguishers
4-82	Uninspected Commercial Vessel Safety
5-82	Fixed Ballast
6-82	Servicing and Inspection of Inflatable Liferafts Utilizing Voluntary and Third Party Inspection Organizations
7-82	Sample Format of Vessel or Facility Station Bill
8-82	Load Line Certificates
9-82	MSD Certification
10-82	Acceptance of Plan Review and Inspection Tasks Performed by the American Bureau of Shipping for New Construction or Major Modifications of U.S.-flag Vessels
11-82	Deck Foam Systems for Polar Solvents

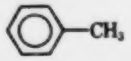
Chemical of the Month

This is the second in a series of four articles discussing derivatives of the chemical benzene.

Xylene: C_8H_{10} or $C_6H_4(CH_3)_2$

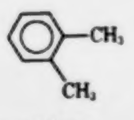
	o-xylene	m-xylene	p-xylene
Synonyms:	ortho-xylene 1,2-dimethylbenzene	meta-xylene 1,3-dimethylbenzene	para-xylene 1,4-dimethylbenzene
Physical Properties			
boiling point:	144°C (292°F)	139°C (282°F)	138°C (281°F)
freezing point:	-25°C (-13°F)	-47°C (-53°F)	13°C (55°F)
vapor pressure at 20°C (68°F):	7 mm Hg	9 mm Hg	9 mm Hg
Threshold Limit Values (TLV)			
time weighted average (TWA):	100 ppm; 435 mg/m^3	100 ppm; 435 mg/m^3	100 ppm; 435 mg/m^3
short term exposure limit (STEL):	150 ppm; 655 mg/m^3	150 ppm; 655 mg/m^3	150 ppm; 655 mg/m^3
Flammability Limits in Air			
lower flammability limit (LFL):	1.0% by vol.	1.1% by vol.	1.1% by vol.
upper flammability limit (UFL):	6.0% by vol.	7.0% by vol.	7.0% by vol.
Combustion Properties			
flash point (o.c.):	32°C (90°F)	27°C (81°F)	27°C (81°F)
autoignition temperature:	463°C (867 °F)	527°C (982 °F)	528°C (984 °F)
Densities			
liquid (water = 1.0):	0.88	0.87	0.86
vapor (air = 1.0):	3.7	3.7	3.7
Identifiers			
U.N. Number:	1307	1307	1307
CHRIS Code:	XLO	XLM	XLP
Cargo Compatibility Group No.	32 (Aromatic Hydrocarbons) for all isomers		

Last month, as you'll recall, we discussed the chemical toluene, a simple derivative of benzene having one methyl group ($-CH_3$) attached to the benzene group.

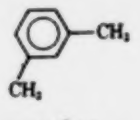


This month we'll discuss the chemical xylene (ZYE-leen).

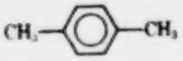
Xylene is composed of a benzene group and two methyl groups. In toluene, since there is but one methyl group, its attachment to the benzene group can be at any of the carbon atoms of benzene (any of the points on the hexagon above used by chemists as shorthand for the benzene ring). Xylene, having two methyl groups, presents a much more interesting situation. The two methyl groups can be attached to the benzene group in three different orientations. Thus, there are in reality, three different xylenes, in other words, three different *isomers* of the molecule xylene. These are the ortho (or o-) isomer, the meta (or m-) isomer, and the para (or p-) isomer. Chemists call them "1,2-dimethylbenzene," "1,3-dimethylbenzene," and "1,4-dimethylbenzene." The numbers indicate the relative points of attachment of the two methyl groups ("di" meaning two) on the benzene group. These isomers can be depicted as:



o-xylene



m-xylene



p-xylene

Many of the properties of the three xylene isomers are very similar, as can be seen from the properties chart above. This similarity of properties presents problems in the production of high-purity individual isomers because it makes it difficult to separate the isomers from each other. The production process used consists of separating the isomers from "BTX" (benzene-toluene-xylene) strings. The problems are further complicated by the contamination of the xylene mixture by ethylbenzene, another derivative of benzene which has many properties similar to the xylenes.

Chemical production figures for 1981, taken from the May 3, 1982, issue of *Chemical and Engineering News*, show that xylene (all three isomers) ranked 23rd in terms of volume produced, while p-xylene alone ranked 30th.

Each of the individual xylene isomers is what is called an "intermediate" for a variety of chemical products such as plasticizers and synthetic resins and fibers. The p-xylene isomer is commercially the most important isomer. Xylene mixtures, called "commercial xylene" and made up predominantly of m-xylene, are used as solvents for paints, among other things, and are a component of high-quality octane blending agents used in fuels.

Xylene is a clear, colorless-to-light-yellow liquid with a characteristic odor. (Xylene and ethylbenzene are members of what are called the "C_8 aromatics)." Xylene is highly flammable, and this is its primary hazard. As is the case with many hydrocarbons (organic compounds consisting primarily of carbon and hydrogen), its vapor is heavier than air and, if released, will flow along the ground or deck. Should it come into contact with a source of ignition, it can flash back to the source of the vapor, causing a fire. Effective firefighting agents are foam, dry chemical, and carbon dioxide. Water fog or spray are effective for cooling but may not work as extinguishants. The products of combustion, such as carbon dioxide and acrid fumes and vapors, may be toxic, and firefighters should use respiratory protection such as a self-contained breathing apparatus.

Xylene can affect the body through skin and eye contact, ingestion (swallowing) of the liquid, or inhalation of the vapor. The effects of short-term overexposure to the vapor are irritation of the eyes, nose, and throat. If inhaled at high concentrations, xylene can cause severe breathing difficulties, which may not appear until some time later. Other symptoms of overexposure are dizziness, staggering, drowsiness, and sometimes unconsciousness. Reversible damage to the kidneys and liver is also a possibility. Liquid xylene can be absorbed through the skin, and long-term exposure may cause a skin rash. Repeated exposure of the eyes to xylene vapor can result in reversible eye damage.

In extreme cases, exposure to xylene can be fatal. About ten years ago, three workers who had entered a fuel tank were grossly overexposed to xylene vapors (the concentration was estimated to have been 10,000 parts per million) and were not discovered for over 18 hours. One worker died of respiratory complications, but the other two recovered completely after a few days.

To protect themselves from exposure to liquid xylene, personnel should wear impervious clothing, gloves, and face shields/splash-proof safety goggles. Contaminated clothing should be removed and thoroughly washed before being reworn (note: keep it away from sources of ignition). Affected skin areas should be washed with soap and water and the eyes flushed with plenty of water. In cases of ingestion, vomiting should not be induced because of the danger of aspiration: if xylene gets into the lungs, it can cause chemical pneumonia. Inhalation overexposure is treated by removal of the victim to fresh air and, if necessary, artificial respiration.

As was the case with toluene, xylene's structural relationship to benzene gave rise to fears that it would cause similar toxicity problems of the blood and blood-forming organs (leukemia). Once again, these fears proved unfounded. Pure xylene does not seem to have these toxic effects. Toxicity is a problem only with impure grades contaminated with varying amounts of benzene. Results of human and animal tests indicate that "alkylation" (the addition of the methyl groups to the benzene ring) results in a loss of the myelotoxic activity (destruction of bone marrow) exhibited by benzene. The major toxicity problem of xylene is its narcotic effects, which are readily reversible and easily avoided by simple precaution.

Xylene is regulated by the U.S. Coast Guard as a Subchapter D commodity, Grade D combustible liquid. IMO, the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization) does not regulate it. The U.S. Department of Transportation classifies xylene as a flammable liquid. Both the Environmental Protection Agency and IMO consider it a Class C pollutant.

Hazard Evaluation Branch
Marine Technical and
Hazardous Materials Division

Next month: ethylbenzene

THE HIGH COST OF SMALL DETAILS

Two recent tankship casualties point out the need for constant attention to details, even when it appears that a situation is the same as it has been in the past.

The Collision

The first incident involves a tanker that was in the Gulf of Mexico en route to a Texas port and was taking a shortcut through the oil fields. The captain considered the safety fairways to be too congested with foreign-flag shipping, and he had used the same trackline through the oil fields for years. Two things made this transit different. First, a hurricane had blown through the area a few days before and disabled the navigation lights on many structures. Second, a new oil and gas production structure was under construction in his trackline.

The voyage ended with the tanker impaled on the structure, exploding and burning. Both the vessel and the structure were total losses. Monetary losses measured in the tens of millions of dollars. Why did the watch officer on the bridge of the tanker fail to detect the new platform until seconds before running right over the middle of it?

To begin with, the navigation lights on the new structure were not functioning. This should have posed no problem for a tanker with two radars and a lookout on a clear, calm, warm night. Although the new structure did not have the platform, house, and machinery installed on it and presented a reduced radar target, there should have been a good image from that much steel framework. However, the radar presentation was affected by another problem.

There was a mast forward of the bridge that created a masking or shading of the radar display in the area directly ahead of the ship. The investigating officer concluded that it probably did not completely obscure that sector and the radar was considered functional. However, questions remain because the officer on watch did look at the radar several times prior to the collision. Also, the collision avoidance system which used that radar as the source of its information showed no indication of the structure.

The mast that interfered with the radar was no longer used, and the master had requested that it be removed. Granting that there are masts and other obstructions that cannot be removed from vessels, what should be done about radar obstructions? To begin with, both radars could have been used, and they would not have had the same obscured area directly forward. One should also question why the first radar antenna was not placed off the centerline of the vessel, which would have prevented interference with the image directly ahead.

Another detail was the location of the lookout. From his normal clear-weather station on the bridge wing, he thought the structure was a barge and saw it only moments before the collision. Had he been on the bow, the low, dark structure might have been noticeable sooner.

The final detail was the use of an inaccurate navigation chart. The captain and the navigator did not subscribe to or obtain the latest Notice to Mariners which noted the construction of the structure and listed its location for correcting charts.

The correction of any one of these details might have prevented the collision. Each of them served to deprive the individuals responsible for that vessel of one vital piece of information.

The Explosion

The second incident involves a tanker that experienced a severe explosion resulting in about $20,000,000 in damages. Luckily, there were few people on board at the time, and everyone escaped without serious injury. Because a packing gland on the propellor shaft was leaking, there was more bilge water than the after peak tank could hold. The excess was being routed through an auxiliary bilge line, through the after pump room, up onto the main deck, and through an old butterworth hose into the aftermost center cargo tank through a butterworth opening. The cargo tank was not gas-free.

At the time of the explosion, the auxiliary bilge line was not in use, but the butterworth plate had not been replaced. The Chief Engineer directed a member of the engineering department to perform maintenance on the bilge piping system, which included welding a reducer nipple into the auxiliary bilge line that ran to the main deck. The crewman cut the hole and tack-welded the nipple into place and then went to lunch. At this time, the valve on the main deck was open and the nipple was open, allowing air to flow through the line. The hose attached to the bilge line was at least in the vicinity of the butterworth opening and more likely still in it.

Shortly after the crewman started welding again after lunch, the explosion occurred. The Coast Guard investigating officer concluded that the actual source of ignition could not be determined but that the most probable source of ignition was the welding operation. This probability must be considered high, because very little else was happening on the ship and every other possible source was checked (including such subtle things as the autoignition of pyrophoric iron sulfide deposits, a form of rust, in the cargo tank). After the explosion, several persons who inspected the vessel noted air being emitted from the hole in the bilge line with the new nipple. This lends weight to the idea that explosive vapors were drawn into that line during the two hours that work stopped for lunch.

It appears that the welding was the source of ignition, but it is certain that the pathway to the non-gas-free tank was through the butterworth opening that was left open, unattended, and without a firescreen. Had the butterworth opening been secured in accordance with Federal regulations (Part 35.30-10 of Title 46 of the Code of Federal Regulations), the explosion would not have occurred. Just as in the collision, a sense of complacency probably contributed to this casualty. In this case, confused lines of responsibility between the deck and engineering departments also played a role. With reduced manning, responsibility for activity on deck was not properly addressed.

All ten members of the crew escaped the fire on the tankship that exploded in port, and the fire was brought under control as quickly as could be expected, considering that the casualty occurred in a remote area. Fortunately, the Coast Guard Cutter CLAMP was working not far from the explosion, and the crew of the CLAMP saw the fireball and heard the explosion. The Officer in Charge, Senior Chief Boatswain's Mate Lawrence Mitthauer, got CLAMP underway immediately. The cutter and its crew were nosed into the tankship in the center of the explosion area, spudded into the river bottom, and fighting the fire within 30 minutes. The small boat from the CLAMP had already been launched and was rescuing seven men from the stern of the tanker. A few minutes later the fire trucks from the Port Arthur and Port Neches (Texas) Fire Departments began arriving on the scene. At the same time, the ocean tug DOMAR CAPTAIN nosed into the side of the tanker and also began fighting the fire. Within 50 minutes, the two duty officers from the Coast Guard Marine Safety Office in Port Arthur arrived on scene. LTjg Robin Kutz boarded the CLAMP to direct firefighting from the water side, and LTjg Thomas Tansey joined the firefighters on the shoreside. Shortly after that, four patrol boats from MSO Port Arthur arrived and joined in the firefighting effort.

The fine cooperative effort displayed by the fire departments and the Coast Guard Marine Safety Office was a result of planning and training exercises conducted by the Sabine-Neches Chiefs Association. The investigating officer, in his report, recommended special recognition for the crews of the CLAMP and DOMAR CAPTAIN, the MSO Port Arthur duty officers, and the Port Arthur and Port Neches Fire Departments. ‡

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. A six-strand composite rope made of alternate fiber and wire strands around a fiber center, commonly designated as 6X3X19, is called

A. spring-lay rope.
B. lang-lay rope.
C. hawser-lay rope.
D. cable-lay rope.

REFERENCE: Knight's

2. Stability information based on the results of the stability test shall be prepared by the owners of the vessel. This information is valid only when approved by

A. the American Bureau of Shipping.
B. the Commandant of the U.S. Coast Guard.
C. U.S. Salvage.
D. Lloyd's of London.

REFERENCE: 46 CFR 93.10(a)(b)

3. The space containing carbon dioxide cylinders shall be properly ventilated and designed to prevent an ambient temperature in excess of

A. 75^{o}F.
B. 100^{o}F.
C. 130^{o}F.
D. 165^{o}F.

REFERENCE: 46 CFR 95.15-20

4. How often must cargo booms be weight-tested by the American Bureau of Shipping to reaffirm their safe working load?

A. Every four years
B. Every two years
C. Annually
D. At each drydocking

REFERENCE: 46 CFR 91.37 1(d)

5. You are proceeding at a slow speed with your starboard side near the right bank of a channel. If your vessel suddenly sheers toward the opposite bank, the best maneuver would be

A. full ahead, hard left rudder.
B. full ahead, hard right rudder.
C. full astern, hard left rudder.
D. full astern, hard right rudder.

REFERENCE: Knight's

ENGINEER

1. Upon dismantling a fuel-injection pump, you find the plunger scored and the barrel in good condition. You should

A. replace the plunger only.
B. turn the plunger in a lathe.
C. replace the plunger and barrel.
D. use fine grinding compound to smooth the scores.

REFERENCE: Maleev

2. The time between fuel injection and ignition in a diesel engine is known as

A. injection lag.
B. ignition lag.
C. detonation lag.
D. precombustion lag.

REFERENCE: Maleev

3. Oil oxidation as a result of excessively high lube oil temperature is harmful to a diesel engine because

A. oil foaming will always occur.
B. large quantities of oil are consumed.
C. lube oil viscosity is always decreased.
D. corrosive by-products are usually formed.

REFERENCE: Stinson

4. When used as a separator, a centrifugal purifier may lose its seal and cause

A. water contamination of the lube oil.
B. the purifier pump to lose suction.
C. water flow from the oil discharge.
D. oil flow from the water discharge.

REFERENCE: Osbourne 1

5. The main propulsion diesel keeps running after you try to shut it down. You should

A. stop the air supply.
B. engage the jacking gear.
C. secure the lube oil pump.
D. shut off the fuel at the day tank.

REFERENCE: Maleev

ANSWERS

DECK
1.A;2.B;3.C;4.A;5.B
ENGINEER
1.C;2.B;3.D;4.D;5.A

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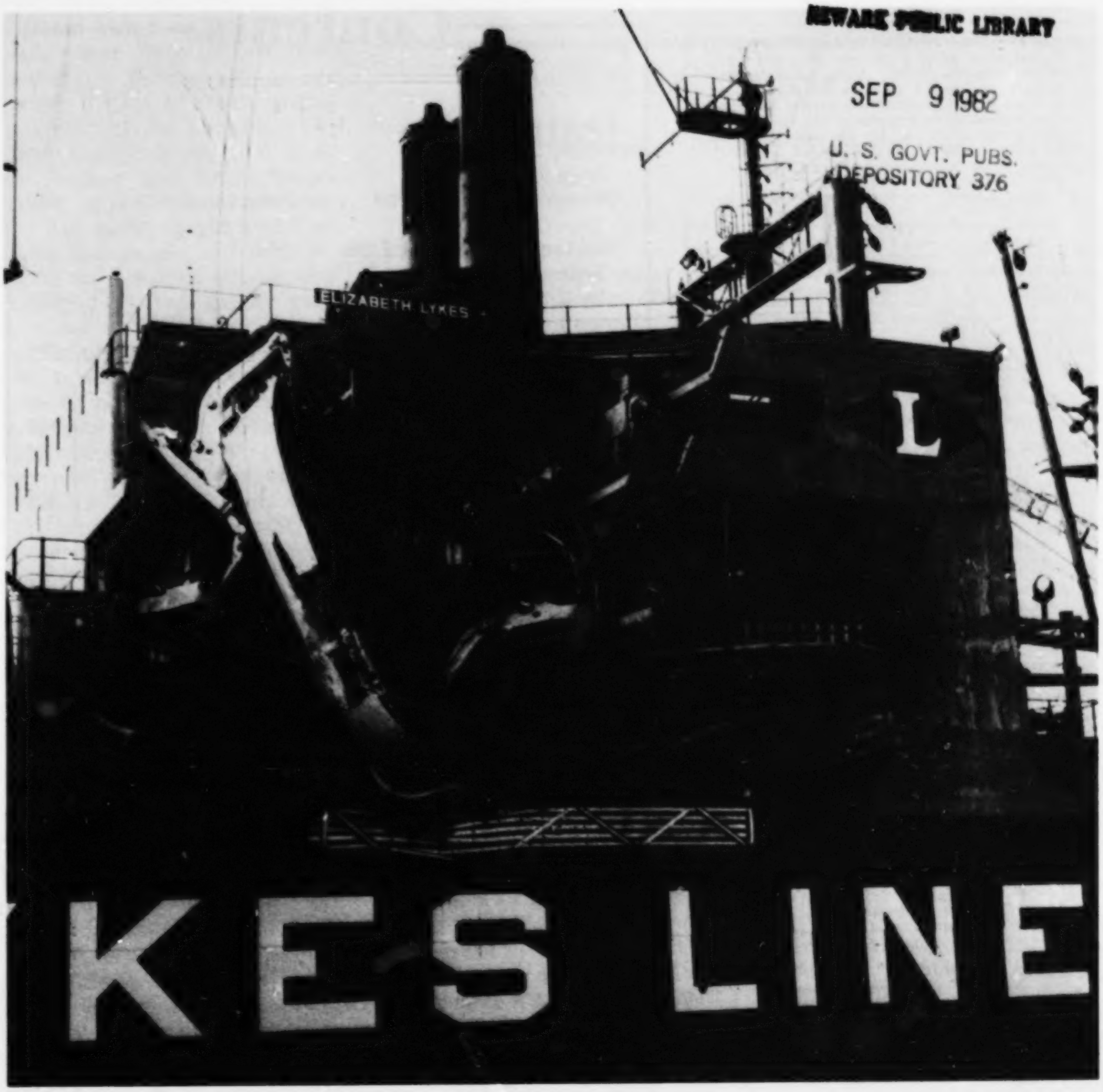
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Proceedings
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Admiral James S. Gracey, USCG
Commandant

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United States Coast Guard:

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When you have finished reading this issue, please pass it on.

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cover

Since man first took to the waters, the weather has been one of his greatest enemies, as can be seen from the damage done by Hurricane Betsy to the ELIZABETH LYKES in 1965. To minimize costs, delays, and catastrophes, today's ocean carriers can turn to some of the most sophisticated equipment available. "Weathering the Seas," reprinted courtesy of Lykes Bros. Steamship Co., Inc., begins on page 235.

A Letter from the Editor

I'm sure all of you are familiar with the current drive to cut back Federal spending. Evidence of cost-cutting measures is everywhere. Notice, for example, the very magazine you are holding. The need to keep our expenses down has forced us to go to a cheaper paper stock. Cutbacks have also added new challenges to my job as an editor. I went to check on the progress of an article the other day, only to find that the author had been transferred to a different division and had given up plans of finishing the article. I went to check on a second article and was told by the author that because some of his fellow employees had been let go, he had taken on so much extra work he no longer had time to write the article. Scheduling publication dates for stories becomes a chancy proposition when the future of many Federal programs is in doubt. I had originally planned to save the article on the Fire and Safety Test Detachment ("Setting Fires for Safety, May 1982) for the October "Fire Prevention Week" issue. I was told, however, that the testing facility was in danger of being closed and might not be in existence by October. Since I thought the article was interesting and informative, I decided to run it right away. (Funding for the facility, by the way, has since been approved for another year.)

The continued existence of the *Proceedings* itself has been less than a foregone conclusion from time to time. Recently, the Office of Management and Budget has been closely examining all government publications. Although OMB routinely reviews publications, the latest review was a very special one. OMB was looking not only at costs and distribution but also at the purposes of a publication and its benefits to the public. I am glad to tell you that publication of the Proceedings has been approved by OMB through March 1985. Consequently, whatever problems I may have with disappearing authors and evaporating articles, at least the magazine will survive.

Julie Strickler

Julie Strickler
Editor

Maritime Sidelights

RORAC Members Announced

The Coast Guard has announced the names of the members appointed to RORAC, the Rules of the Road Advisory Council established in accordance with Public Law 96-591, the Inland Navigational Rules Act of 1980. The council's function will be to advise the Secretary of Transportation on matters relating to any major proposals for changes to the Inland Rules.

The members are: Gordon W. Paulsen, Haight, Gardner, Poor & Havens Law Firm; Lester C. Bedient, Crowley Maritime Corporation; Wayne Williams, Institute for Survival Technology at NOVA University, Robert Williams, North Carolina Seafood and Industrial Park; Eugene Dinnocenti, Twin County Construction Company; Lester Dutcher, SUNY Maritime College; Ed Jacobson, Ogle Bay Norton Company; Howard Krasnoff, Bluewater Yacht Builders, Ltd.; Paul M. Hammer, American Institute of Merchant Shipping; William R. Herder, Port of Newport; Warren A. Hines, Trial Attorney; Louis Kapelski, Delaware River Ferry Company; Charles F. Lehman, American Commercial Barge Line Company; G. James Lippmann, American Boat & Yacht Council; Harvey E. MacDermid, Lake Pilots Association, Inc.; Matthew B. McGowan, Santa Fe - Pomeroy, Inc.; Frank Fitzpatrick, Franklin Mint Corporation; Robert M. Lumpp, Great River Packet Company; Pat J. Neely, Jr., American Pilots Association; William L. Rich, Jr., International Organization of Masters, Mates, and Pilots, AFL-CIO; and Arthur J. Thomas, San Francisco Bar Pilots Association.

Maritime Advisory Committee Meets for First Time

The Maritime Advisory Committee held its first meeting on June 7 in Washington, DC. The committee, established earlier this year, will meet periodically upon the request of Maritime Administrator Harold E. Shear to discuss maritime problems, developments, and issues.

The 21 members of the committee represent a cross section of U.S.-flag ship owners and operators, shippers, and representatives from shipyards and seagoing and shoreside labor. During the first meeting, each member provided a brief status report on his segment of the industry and its major problems and concerns.

Secretary of Transportation Drew Lewis, who delivered the opening remarks at the meeting, told the committee of the Reagan Administration's commitment to strengthening the U.S. merchant marine. He also reported on the status of a number of maritime proposals.

Proceedings on Hazardous Spills Available

The 1982 Hazardous Material Spills Conference, sponsored by the Coast Guard, the U.S. Environmental Protection Agency, the Chemical Manufacturers' Association, and the Bureau of Explosives, was held in Milwaukee, Wisconsin, April 19 - 22, 1982. The proceedings of the conference, the sixth such biennial national conference on this subject, are now available for purchase. Among the 81 papers included are case histories of emergency clean-ups and descriptions of recently developed techniques for preventing and mitigating spills.

The proceedings can be ordered from Government Institutes, Inc., P.O. Box 1096, Rockville, MD 20850; (301) 251-9250. The price of the 510-page volume is $48.50.

Seattle Hosts Northwest Divers Festival

The diving community of the Pacific Northwest will be putting on a diving show the weekend of October 8, 9, and 10 at the Highline Community College just outside of Seattle. Sponsored by the Northwest Diving Safety Council, a nonprofit local diving organization whose goal is to promote the sport of SCUBA diving and diving safety, this year's Festival will be a 3-day event designed for both divers and non-divers.

Scheduled for the Festival are lectures by divers, manufacturers, and medical experts in the field, manufacturers' exhibits, movies, "in-pool" workshops, free introductory SCUBA courses, an invitational underwater photographers' exhibition, an antique diving equipment display, a diving fashion show, presentation of the Northwest Diving Safety Award, CPR certification courses, a helicopter-assisted open-water rescue clinic, and the 8th Annual Northwest Sea-Story-Telling Contest.

Tickets are available through Rick Kaiser and the Northwest Diving Safety Council for $13.50 (advance) or $15.00 (at the door). For further information about the Festival, write to:

Northwest Divers Festival
3916 Dayton Avenue N.
Seattle, WA 98103

Reports Available from NTIS

The Maritime Administration (MarAd) has recently released a number of reports. All of the following can be ordered from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

"Usage Pricing for Public Marine Terminal Facilities" contains the results of a 21-month joint MarAd-American Association of Port Authorities project. Seventeen coastal and Great Lakes ports participated in the study, which was conducted by the Applied Systems Institute, Inc., under a MarAd contract. The report focuses on the determination of dockage and wharfage tariff rates, rental prices for leased terminals, and rental prices for cranes and equipment. The order number for the report, which costs $22, is PB82-180878.

"Merchant Vessel Advanced Power Systems" is the result of a study identifying and evaluating highly advanced propulsion power plants with potential marine applications beyond the year 2000. The survey included advanced power plant designs for central station and industrial power plants and for transportation of vehicles. Each power plant concept was evaluated for potential application to a variety of hull types using available transmission systems and propulsion thrusters. The order number is PB82-185240, the price $18.

"A Study of Multimode Express Shipping" is a two-volume report on the potential commercial applications of high-speed and multimode ships operating at a minimum of 40 knots and capable of carrying at least 1,000 tons of cargo. These advanced special-purpose craft include hydrofoils, air cushion vehicles, surface effect ships, and small waterplane area twin hulls (SWATH). The study, prepared by IMA Resources, Inc., for MarAd, surveyed existing vessels and those in design stages, including buoyant lift, dynamic lift, and powered-lift. The report concludes that dynamic lift and powered-lift design vessels are most adaptable to commercial application. During the course of the study, potential markets were identified, case studies in selected international and domestic applications were considered, and the economics of such craft was calculated. The order number for Volume I (the Final Report, costing $15) is PB82-179508. The order number for Volume II (the Appendices, costing $31.50) is PB82-180159.

Seamanship Trophy Awarded

Captain John J. Janus of Waterbury, Connecticut, has been awarded the 1982 American Merchant Marine Seamanship Trophy for the rescue of 10 survivors of a small floundering boat in the South China Sea on June 21, 1981.

The award was announced by ADM Harold E. Shear, USN (Ret.), Maritime Administrator and Chairman of the Trophy's Select Committee.

The small boat had departed the People's Republic of China with its occupants seeking political refuge in Taiwan. They were about 100 miles from their destination when they were hit by seas and winds generated by a distant typhoon.

Captain Janus' vessel, American President Lines' PRESIDENT McKINLEY, was en route to Pusan, Korea, from Hong Kong at about 12:30 a.m. when the small boat was sighted in distress on the starboard side. The night was very dark, and the winds were southwesterly at gale force. The general alarm was sounded, all hands went to emergency stations, and Captain Janus began to navigate his vessel to effect rescue. Displaying outstanding seamanship under every adverse weather condition, he expertly maneuvered the PRESIDENT McKINLEY alongside the floundering boat, and a pilot ladder was lowered so the survivors could be brought aboard.

This is the 16th Seamanship Trophy awarded. Last year the trophy went to Captain Arthur H. Fertig and the crew of the tanker WILLIAMSBURGH for the rescue of more than 450 passengers and crewmembers of the Dutch cruise ship PRINSENDAM, which burned and sank off the coast of Alaska in October 1980.

Nominations for the American Merchant Marine Seamanship Trophy are received on a continuous basis. The 1983 award will cover events occurring in 1982. Award criteria and information can be obtained from the Office of the Eastern Region Director, Maritime Administration, 26 Federal Plaza, 37th Floor, New York, New York 10278.

International Hydrographic Organization Meets

The International Hydrographic Organization (IHO) hosted its twelfth international conference April 20 - 30 in Monaco. The agenda was extensive and included chart specifications, international chart schemes, radio navigational warnings, special routing guides, a standard list of charts and publications proposed by the International Maritime Organization, and worldwide navigation systems.

The U.S., attending for the first time, was represented by a delegation consisting of officials from the National Oceanic and Atmospheric Administration's National Ocean Survey and the Defense Mapping Agency.

IHO is an intergovernmental body which serves as a forum for addressing oceanographic, hydrographic, and charting matters on the international level.

(Reprinted from the Activities Letter of the American Institute of Merchant Shipping)

Propeller Club Awards Prizes to Essay Contest Winners

Four college students have won cash prizes totaling $1,400.00 in the 1982 National Maritime Essay Contest for college students sponsored by The Propeller Club of the United States and its local clubs. Four others won Honorable Mention. The national prizes were presented by local clubs along with local prizes in connection with observance of National Maritime Day, May 21, 1982.

Winning 1st Prize (and $500.00) was Brian L. Cook, a student at the U.S. Merchant Marine Academy in Kings Point, New York. In second place (winning $400.00) was Matthew K. McKinney, Marshall University, Huntington, West Virginia. Luciene Litchfield, Maine Maritime Academy, Castine, Maine, won 3rd Prize ($300.00), and Elaine M. Saunders, the University of Maryland, College Park campus, won 4th Prize ($200.00).

Twelve College Student Propeller Clubs throughout the country participated in conducting this national essay contest, which aims to develop interest in marine transportation careers and the maritime industry generally and emphasizes the need for a strong American Merchant Marine to ensure national security and economic prosperity. ⚓

The following items of general interest were published between May 21, 1982, and June 18, 1982:

Final rules: CGD 05-81-16R Northwest Harbor, Baltimore, Maryland, Anchorage Regulations, May 27, 1982. CGD 09-82-08 Regatta Regulations B & T Icebreaker Regatta, Niagara River, New York, May 27, 1982. CGD 13-82-062 Drawbridge Operation Regulations; Willamette River, Oregon, June 7, 1982. CGD 81-038A Visual Distress Signal Equipment Requirements, June 7, 1982. CGD 05-81-10R Drawbridge Operation Regulations; Roanoke River, North Carolina, June 7, 1982. CGD 81-039 Merchant Marine Technical Branch, Fifth Coast Guard District, Disestablishment of, June 7, 1982. CGD 07-82-01 Drawbridge Operation Regulations; Garrison Channel, Tampa, Florida, June 7, 1982. CGD 09-82-15 Regatta Regulations; Duluth Harbor Fireworks Display, Duluth, Minnesota, June 10, 1982. CGD 09-82-16 Regatta Regulations; Wishing Well Classic Regatta, Lake St. Clair, Michigan, June 10, 1982. CGD 09-82-11 Regatta Regulations; International Freedom Festival Regatta, Detroit River, Michigan, June 10, 1982. CGD 09-82-12 Regatta Regulations; Stroh Gold Cup Regatta, Detroit River, Michigan, June 10, 1982. CGD 80-143 Load Line Assignment and Surveys; Fees and Other Expenses, June 10, 1982. CGD 81-063 Correction; Delegation of Authority Under the Regulatory Flexibility Act, June 14, 1982. CGD 13-82-02 Security Zone; Strait of Juan de Fuca and Hood Canal, Washington, June 14, 1982. CGD 03-82-02 Drawbridge Operation Regulations; Lemon Creek, New York; Revocation, June 17, 1982. CGD 09-82-021 Drawbridge Operation Regulations; Genesee River, New York, June 17, 1982. CGD 03-79-014 Drawbridge Operation Regulations; Great Channel, New Jersey, June 17, 1982.

Notices of proposed rulemaking (NPRMs): CGD 81-058 Boundary Lines; Seagoing Barge Act, June 7, 1982. CGD 09-82-06 Special Anchorage Area, Lake Betsie, Frankfurt, Michigan, June 17, 1982. CGD 81-080 Traffic Separation Scheme, June 17, 1982.

Notices: CGD 82-053 Additional Loran-C Coverage in Prince William Sound, Alaska, Notice of Public Meeting, May 24, 1982. CGD 82-059 Rules of the Road Advisory Council, Notice of Establishment, May 27, 1982. CGD 82-060 Proposed Bridge Across the Danvers River Between Salem and Beverly, Massachusetts, Notice of Public Meeting, May 27, 1982. CGD 82-062 Rules of the Road Advisory Council, Notice of Public Hearing, June 7, 1982. CGD 75-001 Elevators and Dumbwaiters, Notice of Termination of Rulemaking, June 7, 1982. CGD 74-284 Fixed Fire Extinguishing Systems, Notice of Comment Period Extension, June 10, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Project to Update Waterfront Facilities Regulations Withdrawn (CGD 77-128)

The Coast Guard has withdrawn its proposal to revise its waterfront facility regulations. This project would have updated the regulations and reorganized Part 126 of Title 33 of the Code of Federal Regulations. An advance notice of proposed rulemaking to solicit comments was published on April 12, 1978. After reviewing the more than 280 written comments received and the input from public hearings, the Coast Guard decided against revising the regulations at this time.

For further information, contact LCDR Gary Gregory, U.S. Coast Guard (G-WPE-3), Washington, DC 20593; (202) 755-1354.

Project on Hazardous Wastes Withdrawn (CGD 79-095)

The Coast Guard published an NPRM on October 14, 1980, notifying the public of its intent to incorporate Environmental Protection Agency (EPA) requirements for shippers of hazardous wastes in bulk by water in Title 46 of the Code of Federal Regulations (which covers shipping regulations). Under these requirements, the operators of vessels transporting such cargo must have ID numbers, carry cargo manifests, report spills, and keep the hazardous waste manifests for three years. The Coast Guard has decided that the benefits did not outweigh the cost of publishing the regulations and the potential for conflicts with the EPA regulations.

For further information, contact Robert M. Query, U.S. Coast Guard (G-MTH/14), Washington, DC 20593; (202) 426-1217.

Guidelines Developed for Control of Noise Aboard Ship (CGD 79-134)

On June 16, 1980, the Coast Guard published a notice in the FEDERAL REGISTER telling the public of its intent to promulgate shipboard noise abatement regulations. The Coast Guard has been studying the health and safety problems associated with high noise levels aboard ship for several years. Public hearings were held and input from the Towing Safety Advisory Committee obtained. Based on the comments received, the Coast Guard decided to address the problem by non-regulatory means. It has now issued to the maritime industry a set of recommended guidelines for protecting crewmembers from the hazards associated with high noise levels.

The guidelines are contained in Navigation and Vessel Inspection Circular (NVC) 12-82, "Recommendations on Control of Excessive Noise," and are considered applicable to all vessels and offshore units inspected by the Coast Guard. They are also regarded as appropriate for uninspected commercial vessels for owners desiring an alternative to the noise regulations of the Occupational Safety and Health Administration (OSHA).

Essentially, the NVC recommends a limit on the cumulative daily noise exposure of each crewmember and a program of periodic hearing tests for each crewmember exposed to noise above a certain level. It also recommends maximum noise levels for berthing, mess, and recreation spaces and includes guidelines for related matters dealing with noise control practices and a hearing conservation program. Copies of the NVC are available at the following address:

Commandant (G-MP-4/14)
U.S. Coast Guard
Washington, DC 20593

For further information, contact LT Robert Murray, U.S. Coast Guard (G-MVI-2/24), Washington, DC 20593; (202) 426-2183.

Memorandum of Understanding Between the U.S. Coast Guard and the American Bureau of Shipping Issued

The Memorandum of Understanding published June 10, 1982, sets forth guidelines for cooperation between the Coast Guard and the American Bureau of Shipping in the review and inspection of vessels certified by the Coast Guard. An earlier Memorandum of Understanding published on June 18, 1981, is superseded by this one.

Actions of the Marine Safety Council

June Meeting

The Council discussed five items of general interest at the June meeting and approved each of the items at the work-plan stage. This means that proposed rules will be published in the FEDERAL REGISTER and public comments will be solicited.

CGD 82-046 Regulated Navigation Area, San Pedro Bay

Several collisions and near collisions have occurred in the vicinity of the Los Angeles Pilot Boarding Area. This situation is caused by vessels heading north through the Pilot Area after departing from Long Beach. In order to reduce the potential for collisions, the Captain of the Port Los Angeles-Long Beach issued a COTP order in 1978 on an emergency basis without public comment or review. The COTP order has worked well, and this project would place it in the Code of Federal Regulations to create permanent passive vessel traffic management procedures.

An NPRM should be issued late this summer.

CGD 82-054 Aids to Navigation on Outer Continental Shelf (OCS) Facilities

The purpose of this project is to create realistic standard nationwide light-intensity requirements for OCS facilities. Each time a manufacturer develops new equipment, the Coast Guard must perform burdensome, time-consuming calculations to determine if the lighting equipment meets the requirements of Part 67 of Title 33 of the Code of Federal Regulations (33 CFR 67). Regulations providing for manufacturer certification of lighting equipment would reduce both the burden to the

Coast Guard and delay to the manufacturer.

In addition, the rules would require conformity with the Maritime Buoyage System recommended by the International Association of Lighthouse Authorities. This would mean, among other things, changing the light rhythm characteristics of lights marking OCS facilities from "quick-flashing" to Morse "U." This change is scheduled to be phased in over six years so that replacement costs can be kept down.

An NPRM should be published late this summer.

CGD 82-055 Navigation Safety Regulations

The Navigation Safety Regulations were finalized on January 31, 1977. Since that time, several additions to the regulations have been made, necessitated by the Port and Tanker Safety Act (PTSA), the Safety of Life at Sea Convention (SOLAS), and the Tanker Safety and Pollution Prevention Conference (TSPP). These additions included carriage requirements for electronic position-fixing equipment on vessels 1,600 gross tons (grt) and more, automatic radar plotting aids (ARPA) and second radar sets on tankers, and improved tanker steering gear standards.

CGD 82-055 proposes to revise 33 CFR 164, which has been left rather disorganized by the numerous changes. The TSPP called for additional steering gear drills and tests on vessels 1,600 grt and more; this rule would incorporate those requirements. The requirements for carriage of charts and publications have been found to be enforced inconsistently, with some units issuing large numbers of citations for violations and others issuing virtually none (a total of about 1,300 chart and publication violation citations were issued in 1980 and about 900 in 1981). This rule would redefine the requirements for carriage of charts and publications, thus easing both enforcement and compliance. The proposed change would also redefine the requirements for position fixing and the use of the automatic pilot in U.S. waters, would allow the use of slow in lieu of half speed on the posted bridge maneuvering data, and would clarify COTP authorization to grant deviations to the rules to exclude those items specifically mandated by the PTSA.

An NPRM will be issued early this fall.

CGD 82-058 Safety Standards for Self-Propelled Vessels Carrying Bulk Liquefied Gases

In 1979 the Coast Guard published regulations for liquefied gas carriers implementing the recommendations of the Inter-Governmental Maritime Consultative Organization* as set forth in its Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. The Gas Code has since been amended three times. The three amendments include:

- corrections and clarifications of current Gas Code standards,
- incorporation of standards for new or novel containment system designs,
- improvement of the carriage requirements for several of the more hazardous cargoes, and
- expansion of the list of chemicals to which the Gas Code applies.

The Coast Guard considers these amendments vital to the safe transport of liquefied gases. The United States participated very actively in their development and in many cases initiated consideration of these amendments. It is important now to make U.S. regulations compatible with the accepted international standards. This project proposes to do that by incorporating the amendments into the Code of Federal Regulations.

An NPRM should be issued the first of next year.

CGD 82-067 Implementation of Outstanding MARPOL 73/78 Provisions for Vessels Other Than Tank Vessels

This work plan proposes a regulatory project to amend 33 CFR 151 and 33 CFR 155 for the purpose of implementing the pollution prevention requirements of the International Convention for the Prevention of Pollution from Ships, 1973 and the Protocol of 1978 (known collectively as MARPOL 73/78). It would also revise superseded sections of the Code of Federal Regulations. These changes would be effective at the time MARPOL 73/78 enters into force. Provisions to be implemented include requirements for oil-water separating equipment on ships and drilling rigs, International Oil Pollution Prevention Certificates, and a revised Oil Record Book.

An NPRM is scheduled for spring 1983. ⟂

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* renamed the International Maritime Organization on May 22, 1982

Gracey Takes the Helm

ADM James S. Gracey was sworn in May 27 as the 17th Commandant of the Coast Guard. He succeeds ADM John B. Hayes, who is retiring after 36 years of service. The change-of-command ceremony was held aboard the Coast Guard Cutter ALERT at the Washington Navy Yard in Washington, DC.

ADM Gracey is a 33-year veteran of the Coast Guard. He entered the service in 1945 as a cadet at the Coast Guard Academy in New London, Connecticut. In the course of his career he has headed the Coast Guard's two largest commands, the Atlantic Area, headquartered in New York City, and the Pacific Area, headquartered in San Francisco.

Admirals Gracey and Hayes salute during the change-of-command ceremony.

Other tours of duty include three years as Commander of the Ninth Coast Guard District (the Great Lakes District), headquartered in Cleveland, Ohio, and service as Chief of Staff at Coast Guard Headquarters in Washington, DC.

A native of Needham, Massachusetts, ADM Gracey holds a Bachelor of Science degree from the Coast Guard Academy and a Master of Business Administration degree from Harvard.

While serving in a wide variety of assignments, including command of the Cutter MARIPOSA, ADM Gracey has earned the Distinguished Service Medal, the Legion of Merit (twice), the Secretary of Treasury Achievement Medal, a U.S. Public Health Service Citation, and a number of other awards.

He is married to the former Dorcas R. Neal of Needham, Massachusetts, a graduate of Middlebury College and the University of Maryland Graduate School of Education. They have three children—Kevin, Cheryl, and Pamela. Married in 1949, the couple has served in duty stations from Portland, Maine, to Yakutat, Alaska, and has traveled widely overseas representing the U.S. Coast Guard. ⚓

378-067 0 - 82 - 2

Plotting the Course of the Rules of the Road

by Charles F. Lehman

The following article has been adapted from "The Unruly History of the Rules of the Road," an article Mr. Lehman prepared for the December 1981 issue of the Proceedings of the U.S. Naval Institute; *copyright © 1981, U.S. Naval Institute.*

Upon hearing the term "rules of the road," a non-mariner might think of frustrated vacationers and truck drivers jockeying for position on a much-traveled highway. To a mariner, or anyone involved in the business of transporting goods on water, the rules of the road are as familiar as the story of the Ark. The story of how they came to us may not be nearly as familiar, however.

Laws governing admiralty go back to the time vessels first plied the seas. Jason and the Argonauts had to observe navigation customs in their mythical adventures, as did the Trojans on the expeditions chronicled in the *Iliad* and the *Odyssey*. Phoenician traders, seafaring Polynesians, even the plundering Vikings had to suffer the consequences of not obeying admiralty laws. Today the issue has become even more important and wide-ranging, since we are now faced with the historically unique phenomenon of 350,000-ton supertankers traversing the globe.

Internationally agreed upon rules are a fairly recent development, however. In the past, the different sets of navigation customs were applicable only within certain spheres of influence. Authority and power dictated the extent of those spheres. These rules were not usually written down, which makes plotting their history virtually impossible. The first comprehensive set of written rules originated in the 12th century, when Eleanor of Aquitaine, on the Island of Oleron, took an interest in the various customs that prevailed among seafarers and had them put into writing. (Eleanor, Queen of France under Louis VII, later Queen of England under Henry VI, and the mother of Richard the Lion-Hearted, was the most famous woman of her day.) The Laws of Oleron, as they became known, are generally regarded as the world's first written code of admiralty laws (except for some fragments of Rhodian Law dating back to 900 B.C.). The 12th-century code dealt with the master, crew, cargo, anchorages, liability, wages, contracts, punishment, fishing, and pilotage, among other things, and penalties could be severe. Regarding the failure of pilots to perform their duties, Rule 23 said in part:

> "If a pilot undertakes the Conduct of a vessel . . . and fail of his Duty therein . . . and the Merchants Sustain Damage thereby, he shall be Obliged to make full Satisfaction for same . . . and if not, lose his Head."

(Just imagine if the Coast Guard had authority to mete out that type of punishment today!)

The Laws of Oleron and, later, the Laws of Wisbuy, a similar set of laws used in the Baltic Sea area, along with the Consolato del Mare

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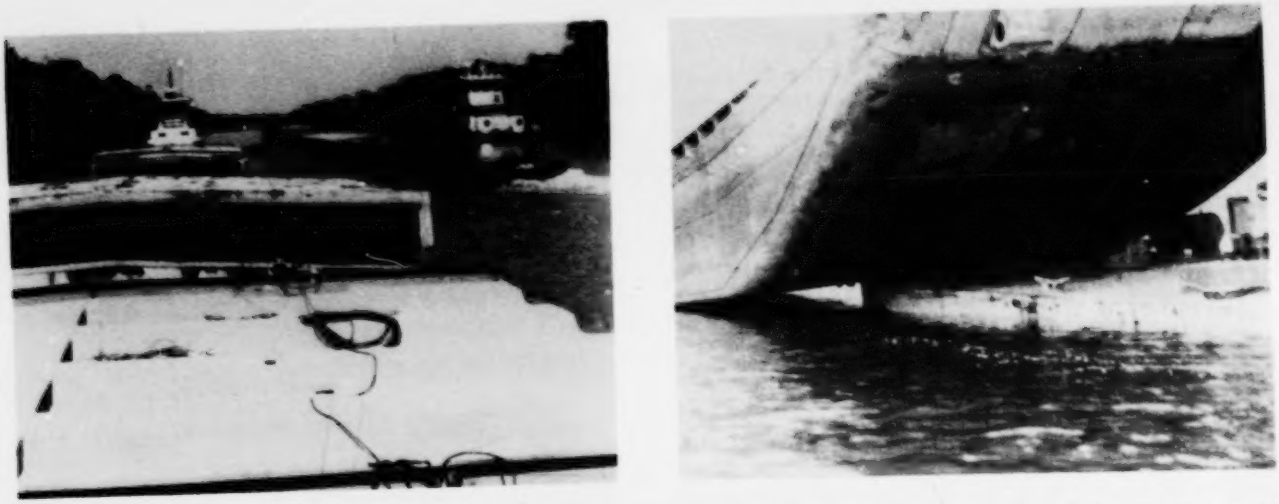
Charles F. Lehman is vice president of the American Commercial Barge Line Company of Jeffersonville, Indiana. He has served as a pilot and master of towboats operating on the inland waters and Western rivers of the United States and is a member of the Rules of the Road Advisory Council.



Right and wrong: left, adherence to the Rules of the Road enables two barge chains in the Gulf Intracoastal Canal to meet and pass each other without incident. Right, failure to observe the rules resulted in a collision between these two barges on the Upper Mississippi.

(used in the Mediterranean states in the 14th century), determined many of the admiralty controversies of the time. Although they were quite extensive for that purpose, they did not address the problem of avoiding collisions. Vessel-to-vessel encounters were haphazard at best, with no required duties between vessels approaching one another.

Perhaps one reason for this cavalier attitude is that in these early days, when only hand-powered and sailing vessels plied the seas, the consequences of a collision were rarely dire, except in cases where acts of aggression took place (in which case navigation customs were not observed anyway). With the advent of the steamboat in the late 1700s, however, the possibilities for serious mishaps increased radically. Still, development of a body of law and regulations for collision avoidance was slow to follow, and when such such laws did develop they were often incomplete and confusing.

Signal lights imply a degree of collision protection because they give an indication of a vessel's location, direction of movement, and speed at times of darkness, the period of greatest danger. Prior to 1838, however, there were no statutes in the United States regulating rules requiring the carrying of signal lights.* The admiralty courts generally held, however, that in the case of a collision when one boat carried a light and the other did not, the one without would be treated as the wrongdoer. This was one of a number of collision-prevention rules that resulted from court cases. Since there were no established national laws, rules developed from the "custom and practice" of pilots.

Congress took note of the courts' decisions and passed the Act of 1838, the primary purpose of which was to assure better security for the lives of passengers on board vessels propelled by steam. One of its provisions was the first U.S. requirement for a navigation light: every steamboat running between sunset and sunrise had to carry one or more signal lights that could be seen by other boats navigating in the same waters. No mention was made of color or brightness or where or how such lights should be located on the vessel.

In 1849, Congress passed a more definitive law which required lights for sailboats and also for power-driven vessels. This Act stated in part:

> ". . . steamboats and propellers shall carry on the stem, or as far forward as possible, a triangular light, at an angle of about sixty degrees with the horizon, and on the starboard side a light shaded green, and on the larboard side red; said lights shall be

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* Editor's note: For readers who may be unfamiliar with the subtleties of U.S. law, statutes are laws enacted by Congress. Regulations are promulgated by Federal agencies to implement the statutes.

furnished with reflectors, &c., complete, and of a size to insure a good and sufficient light . . ."

In this period of the early 1800s, a number of local navigation rules were enacted by numerous cities and states in response to the many casualties occurring. Naturally, this created navigational nightmares for mariners, since there was often no semblance of uniformity or consistency between local rules.

Between 1810 and 1850 there were recorded on the river system 1,070 accidents resulting in the total destruction of the vessels involved. During this time, more than 4,000 persons lost their lives on steamboats. Many of these vessels were destroyed by fires and boiler explosions, but 45 were lost because of collisions.

Congress had been aware for many years that lives and property were being lost because of steamboat mishaps. Among the more horrendous examples were the following cases:

- In 1838 the boilers of the MOSELLE blew up while the vessel was near Cincinnati. Over 150 lives were lost. Less than a week before the MOSELLE exploded on the Ohio River, the steamer ORONOKO had blown up on the Mississippi River above Vicksburg, resulting in the deaths of nearly a hundred persons. The MOSELLE accident was the impetus for passage of the largely ineffective Act of 1838.

- In 1841 fire destroyed the steamer ERIE on the Great Lake for which the vessel was named. Over 175 persons died.

- In November 1846 there was a collision between the steamers SULTANA and MARIA below Natchez, Mississippi. The MARIA sank within five minutes. Approximately 30 persons perished in the mishap.

- In 1847 the PHOENIX caught fire on Lake Michigan near Sheboygan. Over 150 lives were lost. Only about one-third of the persons aboard were saved.

It was the proliferation of accidents, as well as the Federal courts' practice of holding state navigational safety laws void except with respect to vessels on strictly intrastate voyages that finally led to the realization that it was necessary to take action on the Federal level.

The Rules of the Road were developed to prevent collisions such as this one between two vessels in the Strait of Juan de Fuca.

In 1852 Congress passed the Steamboat Inspection Act. Generally, this Act set forth stringent equipment, cargo inspection, and licensing criteria for steamboats and crews. It also set up a Board of Supervisory Inspectors under the Treasury Department and, under Section 29 of the Act, required the Supervisors to establish ". . . such rules and regulations to be observed by all such vessels in passing each other, as they shall from time to time deem necessary for safety."

In 1858 the Board issued a set of Rules and Regulations for the Government of Pilots. These rules required the use of whistle signals to indicate intent in meeting, crossing, and overtaking, for navigating in fog and around blind bends, and to indicate danger. These rules formed the first U.S. system of passing signals for vessels on inland waterways.

Meanwhile, across the sea, similar conditions had prompted the British Parliament in 1846 to give the Crown authority to issue regulations governing the prevention of collisions. Though individual special statutes were enacted prescribing rules for specific areas and cases, no uniform or multinational code was established until 1863, when Great Britain and France implemented similar rules for their waters. Britain and France encouraged the other maritime countries to adhere to the rules as well, sending each country a copy and pointing out the importance of establishing rules which were consistent and uniform, without distinction of flag or of place, and had the force of international maritime law.

In response to this action, a bill similar to the English code was introduced in the House of Representatives in early 1864. It was duly passed and signed into law by President Abraham Lincoln on April 29 of that year to become effective on September 1.

For the first time, the United States, along with other nations of the world, had a set of rules for preventing collisions at sea. These rules were applicable on the high seas as well as on inland waters. The United States, you will remember, had already made some provision for preventing collisions on inland waters in the rules authorized by the Steamboat Inspection Act of 1852. Since they did not conflict, the pilot rules were used to supplement the 1864 code.

For vessels meeting head-on, the rules required that each vessel port its helm, which, in effect, altered its course to starboard so that each vessel could pass to the port side of the other. This right-hand rule has always been the international nautical code. (It is interesting to note that the English rule of the road on land is to go left, even though England pioneered the international maritime laws.)

The law passed by Congress in 1864 gave the U.S., in effect, a set of unified rules. These rules applied to all vessels in all waters and stayed in effect until Congressional enactment of the International Rules of 1885. The latter were limited to the high seas and coastal waters because Congress included a constraining phrase stipulating that

> "Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbor, river, or inland navigation."

This left the 1864 rules and the pilot rules of the Board of Supervisory Inspectors in effect on our inland waters.

It was at this time that the division of rules began taking place in our country. The United States now had two sets of rules for its vessels --one set for vessels on inland waters and another set for those on international waters. In the succeeding years, Congress enacted "special rules" relating to harbor, river, and inland navigation.

Some years after the English code was passed, A. P. Herbert, in his book *Uncommon Law*, described a rather humorous apocryphal lawsuit on the subject of the righthand rule. It seems a Mr. R. was driving his motorcar in England along the Chiswick Mall on the landward, or left, and, therefore, shallow side of a road flooded by the tide. He met a Mr. H. paddling a small boat from the opposite direction. Mr. H., as marine regulations required, went to starboard, forcing the motorcar to also go to his starboard, or right, into deeper water. This caused Mr. R.'s engine to stop. The court, accepting Mr. H.'s argument that when a tide covers a road it becomes part of the tideway, deemed the roadway navigable and enforced the admiralty rule. Since it was the duty of a steam vessel to keep out of the way of a rowing boat and since the automobile was a self-propelled vessel, this put the driver of the automobile in the wrong.

Although extensive in their requirements for lights and conduct in meeting situations, the international rules developed in the 1860s still had not provided for whistle signals, except for the sounding of a steam whistle at intervals of not more than one minute when a vessel was underway in fog or thick weather.

The International Rules of 1885 finally recognized the use of sound signals to indicate the direction of a course change a vessel was taking. Because of the permissive language of the law enacting the rules, however, sound signals were not mandatory. The rules merely stated that a steamship might indicate course change on its steam whistle. The internationally used signals were those of "action": a vessel sounded its whistle to indicate in what direction it would be altering its course. On United States inland waters, signals of "intent and reply" were used: a vessel would sound a signal to indicate on which side it intended to pass another, and the second vessel would answer with a like signal if in agreement.

There were some inconsistencies in the 1885 rules which were revealed by various judicial decisions. In response, Congress authorized the appointment of delegates to an International Marine Conference which was held in Washington, DC, in October 1889. The Conference was attended by representatives of the world's maritime nations. The rules the delegates adopted (the International Rules for Preventing Collisions at Sea) became law in the United

The Bureau of Navigation on the Great Lakes reprinted in rhyme the verses by the Englishman Thomas Gray which pilots committed to memory:

For Two Steamers Meeting End-on or Nearly End-on

Meeting steamers do not dread
When you see three lights ahead!
Port your helm and show your Red.

For Two Steamers Passing

For steamers passing you should try
To keep this maxim in your eye.
Green to Green—or Red to Red--
Perfect safety—go ahead.

For Two Steamers Crossing (This is the real position of danger. There is nothing for it but good lookout, caution, and judgment.)

If to Starboard Red appears,
'Tis your duty to keep clear;
Act as judgment says is proper,
Port, or Starboard—back, or stop her!
But when on your port is seen
A steamer with a light of Green,
There's not so much for you to do--
The green light must keep clear of you.

For All Ships (For all ships must keep a good lookout, and steamships must stop and go astern, if necessary)

Both in safety and in doubt,
Always keep a good look out;
Should there not be room to turn,
Stop your ship and go astern.

Though not entirely in accord with the present statutes, these verses still contain a great deal of common sense today.

States by an act of Congress in August 1890, to go into effect by presidential proclamation.

The 1890 International Rules finally legislated mandatory whistle signals for course changes. But the rules were still unsatisfactory, so further amendments were enacted before President Grover Cleveland's proclamation formally made the code effective as of July 1, 1897.

These rules applied to all vessels on the high seas and vessels on those internal waters capable of being navigated by seagoing vessels, except where local rules were in operation. This exception allowed the existing rules governing our internal waters and the Supervisory Inspectors' rules to remain in effect.

Meanwhile, Congress, on February 8, 1894, had enacted rules for preventing collisions on the Great Lakes and their connecting tributary waters as far east as Montreal. An active group of shipowners and masters on the Great Lakes felt that the Great Lakes presented unique navigation problems and believed the special circumstances in the area demanded special attention.

In June 1897, just before implementation of the new International Rules, Congress recodified the rules for inland waters, excepting the Great Lakes, the Red River of the North, and the waters emptying into the Gulf of Mexico. The recodified rules went into effect on October 1 of that year. Since special rules had been passed for the Great Lakes, this left the 1864 rules in effect on the Red River of the North and rivers emptying into the Gulf. Various admiralty writers took to calling these laws the "Mississippi Valley Rules" or the "Gulf River Rules," but mariners came to refer to them as the "Western Rivers Rules."

Between the time the original set of unified rules was legislated (1864) and the the turn of the century, the U.S. developed four separate and distinct sets of rules: a set for international waters, a set for the Western Rivers, a set for the Great Lakes, and a set for Inland Waters. In addition, we had three sets of pilot rules issued by the Board of Supervisory Inspectors, one for each of the three different groups of internal waters.

Without a doubt, all of these somewhat similar yet frequently conflicting sets of standards were so cumbersome as to confuse even the most knowledgeable and prudent mariner.

To be concluded next month

Weathering the Seas

(Reprinted from Lykes Fleet Flashes, *July/ August 1981)*

Homeward bound from the Mediterranean, the SS MARJORIE LYKES had just passed Gibraltar when the ship's radio came alive with a warning: a large storm was developing straight ahead, 300 miles west of the Azores.

But the ship could dodge the storm, the advisory continued, by changing course a few degrees to the south. The ship's master took the advice. The detour added 200 miles to the transatlantic voyage, but it saved time and possible damage by keeping the vessel out of high winds and rough seas. After an 11-day crossing, the MARJORIE docked in Miami, safe and sound, on schedule, and in good condition.

It was a routine voyage but an example of how modern weather forecasting has made the oceans safer for the ships and the men who sail them. Much has changed since the days when seafarers just sailed into the unknown and hoped for the best.

"With today's weather services, a ship master has access to all kinds of information about weather, seas, and the atmosphere," says Captain Ed Sawyer, head of Lykes' marine charts section. "Today a master can evaluate the data and make an educated decision. He's not just making an experienced guesstimate.

"A lot of things go into choosing a route," Sawyer says. "The shortest distance and best speed are not necessarily the best route. In addition to avoiding storms, we look for following winds, favorable currents, following seas, and other things. By selecting its route carefully, often a ship may go out of its way a couple of hundred miles but reach its destination quicker and without cargo damage."

Much has changed since the days when seafarers just sailed into the unknown and hoped for the best.

Ships have long taken advantage of prevailing winds and currents in selecting their routes. Benjamin Franklin did some of the early work in this field more than 200 years ago.

Today the weather still can't always be predicted with certainty, but modern technology and accumulated knowledge have moved us closer to that goal.

In 1969 Hurricane Camille drove three large freighters, the HULDA, the ALAMO VICTORY, and the SILVER HAWK, ashore in Gulfport, Mississippi, and left them high and dry. The bent screw on the stern of the SILVER HAWK is evidence of the crew's attempt to move the vessel under power to avoid being swept inland. Photos courtesy of the National Oceanic and Atmospheric Administration

"There have been many improvements over the last few years," says William Kaciak, founder and president of Weather Routing, Inc., of Hopewell Junction, New York, which has worked with Lykes for years. "Today we have more satellite pictures, more weather maps, and generally more and better data available.

"Nowadays you're seldom surprised to find a hurricane in an area, because a satellite would show it. Years ago, you might not know the hurricane was around. Now it's harder to get caught by surprise.

"One of the most helpful developments in recent years has been the use of computers for analysis and modeling of the atmosphere, especially the upper air flows. This helps us with some of the long-range forecasts we have to make. All of this additional data helps us develop a better analysis and understanding of what is going on."

"Safety is our primary consideration. Our goal is to minimize exposure to severe or potentially damaging weather, as well as to get as quick a voyage as possible."

As its name suggests, Weather Routing, Inc., specializes in forecasting weather and recommending routes for ships. "There are only about six companies in the world in this field," Kaciak says. "I was one of the pioneers. I started experimenting with weather routing in 1954 or 1955, and I got serious about it about '56 or '57. Today we have six meteorologists on our staff."

"The shortest distance and best speed are not necessarily the best route."

Weather data from all over the world clatter into Kaciak's office over teletype machines. Major sources include the U.S. Weather Service, with its radar pictures, maps, and other information, and the World Meteorological Organization, an international group whose member nations share weather data.

"Collection of weather information is one area where all nations cooperate," Kaciak notes. "Most nations belong to the World Meteorological Organization, and different nations have responsibility for supplying information from their regions. This information is obtained from thousands of reports from land stations, ships, and satellites."

Although modern technology has given weathermen more and better tools to work with, the human element remains essential.

"Long-range weather forecasting is both a science and an art," Kaciak says. "It's an art because it requires experience. Weather forecasters get better as they get more experienced. If it were a pure science, you could teach the fundamentals to a beginner, and he could do the job. But you can't take a beginner and allow him to forecast immediately.

"... there are enough weather maps being transmitted for a ship to receive them almost 24 hours a day."

"The forecasting that we do is different from the one- or two-day forecasts that you get on television or radio," Kaciak explains. "The type of forecast we prepare is five days at a minimum, and we try to extend it through the length of the voyage, maybe 12 days.

"It takes a certain skill," Kaciak says. "Not everyone has it, and it's not something that can be taught. It takes a certain type of person. Some meteorologists are good on short-term forecasting but not long-term. You must have the knack and the aptitude.

"A lot of what makes a good forecaster is intangible," Kaciak muses. "It's like trying to define what makes a great artist or a great musician. You can have the training or education, but you have to have that certain spark also. And you don't really find out whether a person has it until he has worked for one or two years. I've had some very bright people working for me who were brilliant theorists but who didn't have that knack."

A 52-foot Coast Guard vessel beats its way over the Columbia River bar.

Kaciak's firm has recommended routes for hundreds of voyages over the years. One he remembers best involved a passenger ship on a transatlantic voyage several years ago.

The ship left New York with 400 passengers and crewmembers on a voyage to the English Channel at the same time a hurricane was blowing in the Atlantic. "The storm was predicted to travel northeast, which would have put the ship and the hurricane on a collision course," Kaciak recalls.

"Normally in such a case, most masters would proceed west and south in hope of passing south of the hurricane. Instead, I recommended that the master continue eastward. I felt the storm would not continue northeast but would stall and move west. That is what happened. The ship safely passed well north of the hurricane. Had the master taken the standard maneuver, she would have encountered the effects of the hurricane.

"It was a difficult decision to make, with 400 lives at stake. But I felt positive the storm would not come northeast. The data indicated high pressure building over the Canadian maritime provinces. If this high built up, it would prevent the hurricane from moving northeastward. As it turned out, the high did build and prevented the hurricane's movement."

A more recent example of successful weather routing was a voyage this year of the roll-on/roll-off ship TYSON LYKES from Seattle to Yokohama.

"It was a difficult decision to make, with 400 lives at stake. But I felt positive the storm would not come northeast."

There was heavy weather over much of the Pacific, and the TYSON's master, Captain W. R. Day, telephoned Kaciak from his ship. They discussed the situation and reviewed the possibilities. Kaciak said the weather to the south was "horrible" and recommended that the master take a more northerly route than usual. There was heavy weather to the north, too, but the routing kept the ship out of the worst storms, and the ship encountered only a couple of days of really rough weather.

The TYSON made the transpacific voyage in a respectable 8 days and 9 hours, with an average speed of better than 21 knots—good time, considering the circumstances.

"Mr. Kaciak's telephone analysis of the weather for the North Pacific was of invaluable help," Captain Day wrote in his report to Lykes headquarters. The routing, Day said, "resulted in significant savings in bunkers and time."

"All bad weather is not avoidable," Kaciak observes. "When bad weather is unavoidable, we try to minimize exposure to it. There are times when we'll intentionally let a ship get into moderately bad weather for a day or two in order to avoid three or four days of it. Safety is our primary consideration. Our goal is to minimize exposure to severe or potentially damaging weather, as well as to get as quick a voyage as possible."

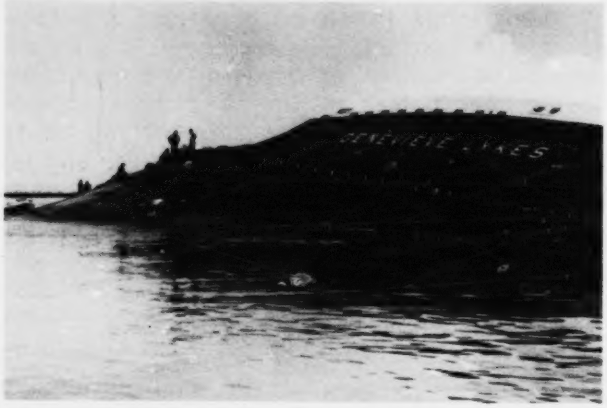
Ship masters communicate with the weather routing service by telex or radio. They report when they expect to pass Gibraltar, the Florida Straits, or some other entrance to open sea, and they give details on their ship's draft, speed, stability, and any special requirements for cargo or handling.

. . . perhaps half of all voyages include some weather problems-- ranging from Pacific swells to Atlantic icebergs to fog . . .

The forecasters respond with a general description of the weather features expected on the crossing and with a recommended route. During the voyage, the forecasters check the ship's position daily and monitor the weather conditions, suggesting course changes if necessary.

No matter what the forecasters recommend, the final decision on routing is made by the ship's master. "He knows what his ship can take and what it cannot. He is on the scene," Kaciak says. "We work together as a team to get the optimum routing. A good relationship between the router and master is vital."

Today's ships have access to a wide range of weather information. "There are marine broadcasts in all parts of the world designed especially for mariners," says Sawyer, of Lykes' marine division. "We have facsimile equipment on our ships, and there are enough weather maps being transmitted for a ship to receive them almost 24 hours a day. These facsimile maps are more detailed than the ones you see on the TV weather. They show wind direction and patterns, seas, fronts, wind speeds, and other meteorological data."



The GENEVIEVE LYKES sank atop the LETITIA LYKES after Hurricane Betsy hit New Orleans in 1965 and blew both vessels eight miles upriver.

Sawyer says that perhaps half of all voyages include some weather problems—ranging from Pacific swells to Atlantic icebergs to fog, which is especially troublesome in the Grand Banks area of the Atlantic, the Pacific Northwest, and at times in the Gulf.

Kaciak says weather routing tends to be more difficult in the Atlantic than in the Pacific because there is less area in which to maneuver around storms. "The Pacific can be difficult, though," he adds. "Some years they've gone through the alphabet twice in naming the tropical storms there. Sometimes they don't get out of the first third of the alphabet."

The last couple of years have brought some abnormal weather patterns, but with weather, Kaciak says, "the normal thing is to have abnormality." During 1980, the oceans were "really turbulent and disturbed," he says, because of arctic air moving farther south than usual in some areas and tropical air moving farther north than usual in others.

"Some years they've gone through the alphabet twice in naming the tropical storms [in the Pacific] ."

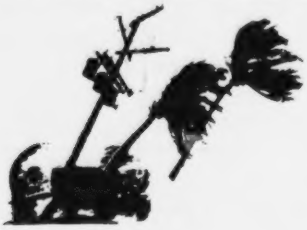
Naturally, storms are more frequent and violent in the northern and southern areas where warm and cold air masses collide. "Around the equator, there aren't too many severe storms," Kaciak says. "However, in routing for a ship near the equator, we'll try to keep track of currents and maybe increase the ship's speed.

"In weather routing, you have to keep up with what's going on in the oceans throughout the world. Changes in the Pacific one week often can be expected in the Atlantic in another week or 10 days. You have to study it on a day-by-day basis to get an understanding of what is happening."

Captain Frank E. Johnson, master of the SEABEE barge, container, and heavy-lift ship DOCTOR LYKES, has sailed with Lykes for 45 years. He welcomes the advances that have been made in weather forecasting and routing.

It gives a ship's master more information to work with," Johnson says. "The weather routing companies can accumulate and process much more information than a single ship ever could.

"But even with the modern reports," Johnson adds, "I still go out and look at the sky every morning to see if it goes with what the information says."



Hurricanes Have Genders, Nationalities, Too

You may have noticed that hurricanes are no longer all "she's." Tropical storms, which may develop into hurricanes, now are given male and female names.

But did you know that the listing is multilingual? This is in recognition of the different nationalities located in or near the Caribbean Sea, Gulf of Mexico, and parts of the Atlantic Ocean where the storms start.

Also, the names of prominent storms, such as "Agnes" and "Camille" are removed from the list and never used again, much in the way the numbered jerseys of outstanding athletes are retired.

A six-year rotating list of names is reviewed once a year under the auspices of the World Meterorological Organization. Names of the "really big ones" are replaced with appropriate new names.

The current practice of using distinctive given names in written and spoken communications has proven to be faster and less subject to error than the older latitude-longitude identification method. These advantages are especially important in exchanging detailed storm information between hundreds of widely scattered stations and airports, coastal bases, and ships at sea.

In the past, confusion and misleading rumors have arisen when storm advisories broadcast from one radio station were mistaken for warnings concerning an entirely different storm located hundreds of miles away.

A tropical storm begins as a "depression" with wind speeds of 25 to 38 mph. It is nameless at that stage and remains so until it builds up steam, generating 39 to 73 mph winds. Then it is designated a tropical storm and gets a name.

When the wind speed reaches 74 mph, the storm is designated a hurricane but keeps the same name.

These are the names to be used during the 1982 Atlantic Basin hurricane season, which is expected to run from June through November:

Alberto
Beryl
Chris
Debby
Ernesto
Florence
Gilbert
Helene
Isaac
Joan
Keith
Leslie
Michael
Nadine
Oscar
Patty
Rafael
Sandy
Tony
Valerie
William

Completely different sets of male and female names are assigned to storms in parts of the Pacific Ocean.

In the Eastern Pacific, the storms are called hurricanes and have predominantly Spanish names, since they primarily affect Central America and Mexico.

Central Pacific storms, also called hurricanes, are given Hawaiian names.

Storms in the Western Pacific are called typhoons and are assigned male and female names. Typhoon advisories are issued from Guam by the Joint Typhoon Warning Center, staffed by Air Force and Navy personnel.

Setting our Sites on Safety

by LT Michael Brown
Port Safety Branch
Eighth Coast Guard District

Waterfront facility siting (deciding where a new waterfront facility such as a dock, oil terminal, or container facility is to be located) has become an increasingly important issue in marine safety. As a waterway becomes more crowded and the volume of hazardous cargoes carried on the waterway grows, the potential for accidents increases. Facility siting can have a major impact on that potential.

There are several factors involved in the siting process. These can be broken down into five categories:

- **Navigation** - Where on the waterway would the facility be best located? What implications will its location have for vessel safety and traffic management?

- **Health, safety, and welfare** - What effect will the facility have on people, both those working in the facility itself and, more importantly, those that live and work in the immediate area?

- **Environment** - How will the facility affect the land, water, and air?

- **Space allocation** - What type of facility is to be sited?

- **Economics** - What economic benefits, if any, will accrue to the local area as a result of the facility's being located there? Could the facility affect the area's economy adversely?

Naturally, these five considerations are interrelated, and there are no rigid lines dividing them. Implicit in the considerations is what commodity the waterfront facility will be handling.

However, only the first three considerations have a bearing on marine safety, and only these three will be examined further in this article.

The usual method of controlling facility siting is through the permit-issuing process. Generally speaking, developers must obtain a multitude of permits from all levels of government before they can build a facility. Many of these permits are not site-related; that is, the location of the proposed facility is of no or very little importance in and of itself. This is true of building permits or Federal Communications Commission licenses, for example. The permits with which we are concerned are site-specific. At issue is whether a facility can be built or located at a given location and, if so, what special conditions (if any) will be imposed.

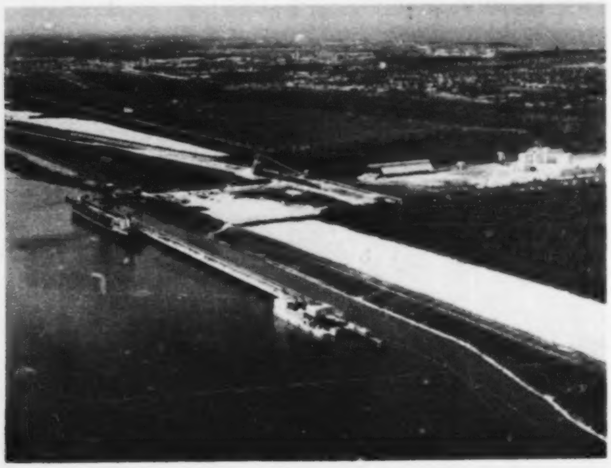
The primary Federal agency involved in waterfront facility siting is the U.S. Army Corps of Engineers (COE). The COE's authority in this area derives basically from the Rivers and Harbors Act of 1899. The primary thrust of this Act is to protect navigation, and it authorizes the COE to issue permits to people wishing to build structures on the navigable waters of the U.S.

In a policy decision in 1968 the COE expanded the scope of the permit review beyond strictly navigational considerations. It now considers fish and wildlife preservation, aesthetics, pollution, and the general public interest. In addition, the Clean Water Act, the National Environmental Policy Act of 1969, the Coastal Zone Management Act of 1972, and the Marine Protection Research and Sanctuaries Act of 1972 all require the COE to consult with various other Federal agencies and obtain either their approval or a statement of no objection before granting a permit.

The normal process is as follows: the applicant applies to the COE for a permit to build a facility. He must also apply to other Federal, state, and local agencies for concurrent permits, as necessary. The COE makes a preliminary environmental impact assessment of the proposed project and determines whether or not an Environmental Impact Statement (EIS) is required. The COE then sends out a notice of the proposed project to the government agencies concerned and to interested individuals. If a draft environmental impact statement (DEIS) is prepared, that will also be sent out at this time. On the basis of the initial comments it receives and the scope of the project, the COE determines whether a public hearing will be held. After receiving all comments, studying the EIS, if required, and conducting a public hearing, if necessary, the COE prepares the final EIS, evaluates all the data, and either grants or denies the permit. If other government agencies object to the proposal and the COE finds the objections reasonable, the COE attempts to iron out the differences between the applicant and the objecting party. If the objection cannot be overcome, the permit is generally not granted. If certain agencies either object to the issuance of a permit or refuse to grant the applicant their permit, then the COE by regulation cannot grant its permit. These agencies include the Environmental Protection Agency (EPA), the National Marine Fisheries, the Fish and Wildlife Service, and the state Coastal Zone Management agency involved.

The Port and Tanker Safety Act of 1978 gave the Coast Guard authority to prescribe standards promoting safety in navigable waters and protecting waters from environmental harm. The COE sends all permit applications to the Coast Guard for review and comments on the navigation aspect of the proposed facility. As a practical matter, the Corps generally will not grant a permit if the Coast Guard objects and a satisfactory arrangement cannot be made between the Coast Guard and the applicant.

At present, the Coast Guard's role in the facility siting process is limited strictly to navigation concerns. Permit application review is usually conducted at the Captain of the Port level. Input is sought from local waterway users such as pilots, vessel operators, and trade associations. Generally, one of three positions is taken: outright objection, no objection, or no objection provided certain conditions are met. Outright objection is taken if the facility as proposed creates an unacceptable hazard in terms of the safety of the waterway. No objection is taken if the proposed facility will not create such a hazard. If the proposed



A facility's proximity to a heavily populated area may limit the types of commodities it is allowed to handle. For some commodities, siting in relatively remote areas may be necessary. Photos by Sam R. Sutton facility will create an unacceptable hazard but mitigating measures can be taken to alleviate that hazard, the position of no objection is taken, provided the mitigating measures are made part of the COE permit.

While the issuing of permits at the Federal level is fairly uniform, the process can vary greatly at the state and local level. State and local governments do not follow any single pattern. Many coastal states have a Coastal Zone Management agency of some form or other that is concerned with siting and land use, and most local jurisdictions (i.e., cities and/or counties) have some form of a planning commission concerned with siting. In addition, there are generally several other state and local agencies that have a say in the siting process. Authority on the state and local level is diffuse and depends on:

- the state in which the facility will be built,
- where in the state it will be built, and
- what the facility will handle.

Authority could be vested in the City, State, County, Autonomous District, Port Authority, or any combination of the above. Within any of those political entities, it could be in either the executive or legislative branch. Public hearings may or may not be held. On all levels, Federal, state, and local, there is a possibility of judicial review.

The type of cargo handled is one of the most important factors officials have to consider when deciding on a site. Shown above are facilities handling petroleum (lower right), grain (upper right), and general cargo (upper center).

The state and local agencies are concerned with all five of the considerations for siting, whereas the Federal agencies are generally concerned only with the first three. Space allocations and economic considerations tend to be more local issues, and the Federal government has only limited authority to act in those matters.

Decisions made on facility siting at all levels are generally of a qualitative nature ("We don't want a facility close to where our children will be playing") as opposed to a quantitative one based on specific criteria ("No facility shall be located within 500 yards of an area zoned for residential development"). In many cases values have not been quantified, and no specific limits have been set. Some Federal agencies have developed specific criteria, but these are either locally applied or not site-specific. (One state, California, is proposing very specific criteria, but this is the exception and not the rule.)

The body approving a permit (the COE, local planning commission, etc.) could develop specific standards by considering some of the following factors. Note that these factors could be quantified and limits set.

Navigation considerations

- Depth of water - The COE recommends design draft of vessel plus two feet plus allowance if there are frequent low tides.
- Width of channel - The COE has a formula of channel width in bends. Other Federal and state agencies have a figure of three times beam of vessel plus ten percent safety factor.
- Maneuvering area - The COE has a standard that considers draft, length of vessel, and size of channel.
- Character of channel (i.e., sharp bends, etc.) - Limits on the size of vessels and restrictions on type of cargo could be established based on the angles of bends and the width and depth of the channel.
- Currents and tides - Limits on the size of vessels and minimum horsepower requirements could be established based on the velocity of currents and range of tides.

- Present traffic patterns - Limits on the size of vessels and restrictions on arrival/departure times could be established based on traffic density and flow.

- Type of bottom - Minimum underkeel clearance could be established based on type of bottom. For example, greater underkeel clearance might be required in areas with a rocky bottom than in areas with a muddy bottom.

- Proximity to other facilities and anchorages (vessels anchored or tied to other facilities may pose hazards to a vessel navigating the waterway) -Minimum spacing requirements between certain types of facilities, between facilities and anchorages, and between facilities and difficult-to-navigate portions of the waterway could be established.

- Anchorage areas - Requirements for accessibility and availability of anchorage areas could be established.

Health, safety, and welfare considerations

- Proximity to a residential or industrial area - Some standards exist as to how close a facility can be to a populated area, but these vary from location to location and usually take the form of a zoning ordinance.

- Noise - Maximum decibel limits could be set.

- Local infrastructure - A certain level of adequacy could be specified (i.e., distance from fire protection and police, access to the facility, distance to emergency care, etc.).

Environmental considerations

- Water spill - Limits could be set on how much of a commodity a facility might handle. Based on a worst-case spill, these limits would ensure that environmental damage would be kept to a minimum.

- Effluent discharge - Criteria are established by EPA for effluent discharge. They generally are not site-specific, however, and modifications based on the environmental sensitivity of the proposed site may be appropriate.

In spite of industry's and government's best efforts, accidents sometimes do occur . . .

- Air pollution - Criteria are established by EPA and the states, but again local modifications may be appropriate.

This list of factors is by no means exhaustive, but it does include some of the most important points to consider. All of these criteria should be addressed regardless of what commodity a facility handles because of their bearing on safety and the environment. What, specifically, the facility handles, however, is extremely important because it determines what limits should be imposed. We are concerned with not only the risk of an accident but also what the consequences of an accident would be, and limits and criteria should reflect this. For example, the margin of safety should be greater for a facility handling a Cargo of Particular Hazard than for one handling grain.

The siting process is not necessarily a yes/no decision. It should be flexible in its treatment of variables and limits. Limits are relatively fixed standards that provide an acceptable level of safety. Variables are conditions that can be adjusted to ensure that the limits are not exceeded. As initially proposed, a facility may exceed the limits, but if the conditions of its operation (the variables) are modified or adjusted, it could operate within the limits and thus be constructed.

For example, an applicant may propose to bring 60,000-DWT vessels carrying 300,000 barrels of Cargoes of Particular Hazard to a facility located one-half mile from a heavily populated area. The authorities may decide that no facility handling Cargoes of Particular Hazard can be located within one mile of areas with a population density of 1,000 or more persons per square mile. In this case, the facility would not be permitted to be sited at all.

Now let's change the variables. Let's say an applicant proposes to build a facility at the end of a channel that is 1,000 feet wide and 40 feet deep, has a 90° bend in it, and has a rocky bottom. He also proposes to bring in fully laden 60,000-DWT vessels drawing 38 feet carrying 300,000 barrels of Cargoes of Particular Hazard including vinyl chloride, acrylonitrile, and oleum. The facility is located in an industrial area, and the nearest other facility is one mile away. The limits may be a minimum of 4 feet bottom clearance, a channel width of 3 times vessel width plus 10 percent, and no bends with more than a 30° angle. The limits could also stipulate that in the event of an accident, considering that all product would be released instantaneously, the vapor cloud could not pose a hazard to any other industrial or populated area. In the event of a fire, similarly, the radiant heat could not damage any other unprotected structures. In this case, the facility could be sited, but certain limiting conditions would be imposed. The vessels could come in light-loaded only (less than 36 feet draft), and a one-way traffic scheme would be imposed in the vicinity of the 90° bend. The vessels would be allowed to carry only 100,000 barrels of cargo so that in the event of an instantaneous release the vapor or heat limit would not be exceeded.

Of course, the actual siting decision is much more complex. More variables would be considered and more limits established. The concept of examining the facility and its location, considering the factors involved, and imposing conditions to either make variables fit within the limits or provide an alternate level of safety would be the same, however.

A valid question to ask at this point is: why have specific quantitative criteria at all? There are two major reasons.

First, by having specific criteria, we can maintain a higher level of safety at what we hope is a minimum cost to industry. For example, speaking qualitatively, you may not want a facility handling Cargoes of Particular Hazard close to a populated area. But how close is close? One mile? One thousand yards? What affords an acceptable level of safety for the public and environment and at the same time imposes the least cost for industry, as the public will ultimately bear this cost?

Second, there is the matter of consistency. A persistent complaint on the part of industry is that the lack of consistency on what is required makes it difficult to plan. If we had a consistent set of standards, planning would be easier and industry would know just what was expected. By deciding standards in advance, we could speed the permit-issuing process.

Of course, not every factor can be quantified, and there will always be a matter of subjective judgment and qualitative analysis in facility siting. There will also be local conditions that will have to be addressed or that may allow for the relaxation of criteria. Facilities mean jobs and other economic benefits, but at the same time they pose environmental, health, and safety risks.

These benefits and risks must be weighed against one another. A set of specific criteria can give us a starting point for determining where and under what conditions a waterfront facility can be sited.

All facilities, especially those that handle Cargoes of Particular Hazard, have an impact on public and navigation safety. We can identify, to a large extent, what hazards are involved, and we know what we want to protect from these hazards. Specific, quantifiable criteria will serve to mitigate these hazards in a consistent, non-arbitrary manner. ⚓

More and more cargo is carried by container, and container facilities are a common sight in almost every major port. Containers can carry virtually any type of packaged dangerous cargo, a factor that should be considered in the siting process.

Chemical of the Month

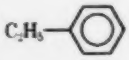
This is the third in a series of four articles discussing derivatives of the chemical benzene.

Ethylbenzene:

C_8H_{10} or $C_6H_5C_2H_5$

Synonyms:	phenylethane ethylbenzol
Physical Properties	
boiling point:	136°C (277°F)
freezing point:	-95°C (-139°F)
vapor pressure at	
20°C (68°F):	7.1 mm Hg
25°C (77°F):	9 mm Hg
Threshold Limit Values (TLV)	
time weighted average	100 ppm; 435 mg/m^3
short term exposure limit:	125 ppm; 545 mg/m^3
Flammability Limits in Air	
lower flammability limit	1.0% by vol.
upper flammability limit	6.7% by vol.
Combustion Properties	
flash point (c.c.):	15°C (59°F)
autoignition temperature:	432°C (810°F)
Densities	
liquid (water = 1.0):	0.87
vapor (air = 1.0):	3.66
Identifiers	
U.N. Number:	1175
CHRIS Code:	ETB
Cargo Compatibility Group:	32 (Aromatic Hydrocarbons)

Like the other two chemicals discussed thus far in this series, ethylbenzene is a variation on the benzene ring described in the June issue. Its name reflects its components; it is composed of a single ethyl group ($-CH_2CH_3$) attached to the benzene group:



Ethylbenzene, along with the three isomers of xylene discussed last month, is a member of the "C-8 aromatics" group. The "C-8" refers to the eight carbon atoms found in these compounds, and the "aromatic" is a chemical family name derived from the pleasant odor of the first few members identified.

Ethylbenzene is a major chemical. In terms of volume produced, it ranked 20th among chemicals in 1981, according to the May 3, 1982 issue of *Chemical and Engineering News*. Ethylbenzene can be made in several different ways. It can be distilled from the xylene component of what are called the "BTX" fractions (benzene-toluene-xylene). Most ethylbenzene, however, is produced through a benzene-ethylene reaction; this method accounts for over 90 percent of the ethylbenzene produced.

Ethylbenzene's primary use is in the manufacture of styrene,* from which polystyrene is made. A small percentage is also used as a solvent in the chemical, paint, and rubber industries.

Ethylbenzene, a clear, colorless liquid, is highly flammable, and this is its primary hazard. Its vapor, like that of many hydrocarbons (organic compounds consisting primarily of carbon and hydrogen), is heavier than air and, if released, will flow along the ground or deck. Should it come into contact with a source of ignition, the resulting flames can flash back to the source of the vapor, setting the entire container on fire. Effective firefighting agents are foam, dry chemical, and carbon dioxide. Water fog or spray are effective for cooling but may not work as extinguishing agents. The products of combustion, such as carbon dioxide and acrid fumes and vapors, may be toxic, and firefighters should use respiratory protection such as a self-contained breathing apparatus.

Ethylbenzene can affect the body through skin and eye contact, ingestion (swallowing) of the liquid, or inhalation of the vapor. The effects of short-term overexposure to the vapor are irritation of the eyes, nose, and throat. Exposure to high concentrations makes the irritating effects more intense. In fact, ethylbenzene is generally considered to have the most severely irritating effects of the four benzene derivatives being discussed in this series. Exposure to high concentrations will result in weakness, dizziness, and a drowsy feeling. Overexposure could lead to unconsciousness. Because the chemical acts as a solvent on the body's natural oils, prolonged or repeated contact with ethylbenzene could cause a skin rash.

---

* See M16616.5, "Safe Handling of Styrene," available from Commandant (G-CMA-3), U.S. Coast Guard, Washington, DC 20593.

To protect themselves from exposure to liquid ethylbenzene, personnel should wear impervious clothing, gloves, and face shields/splash-proof safety goggles. Contaminated clothing should be removed and thoroughly washed before being reworn. Affected skin areas should be washed with soap and water. The eyes, if affected, should be flushed with plenty of water. In cases of ingestion, vomiting should not be induced because of the danger of aspiration; if even a small amount gets into the lungs, it can cause extensive swelling and bleeding. Inhalation overexposure is treated by removal of the victim to fresh air and, if necessary, artificial respiration.

Ethylbenzene is unlikely to catch people unaware because its odor and the irritation it causes warn people of its presence. This would ordinarily preclude exposure to concentrations high enough to damage the body's systems.

Ethylbenzene is regulated by the U.S. Coast Guard as a Subchapter D commodity, Grade C flammable liquid. The International Maritime Organization (IMO) does not regulate it. The U.S. Department of Transportation classifies ethylbenzene as a flammable liquid. Both the Environmental Protection Agency and IMO consider it a Class C pollutant.

Hazard Evaluation Branch
Marine Technical and
Hazardous Materials Division

Next month: cumene

Don't Wake the Sleeping Giant

(Reprinted with permission from the Chevron Shipping Company Safety Bulletin, *February 1981)*

Stories of jet-propelled gas cylinders are not uncommon, but this one did so much damage in the course of its highly unpredictable final few seconds that it deserves mention:

The CO_2 cylinder with cap removed was being moved across an airplane hangar floor. It fell, the valve broke off, and the cylinder took off. It went through several aircraft wings, broke off sprinkler heads and started a flood, destroyed an assortment of equipment, went through a concrete wall, and finally came to rest outside. The damage was estimated at more than a half million dollars.

This sort of accident is not restricted to CO_2 cylinders. Any compressed gas in a cylinder, such as Freon, oxygen, air, acetylene, nitrogen, etc. can react in the same manner. We have many such cylinders aboard ship.

Ship motion and vibration make it especially important to keep all compressed gas cylinders securely retained at all times. The mixing valve, gauges, and hoses should be removed and the protective caps put back on whenever a bottle is not actually in use. ⊥

Lessons from Casualties

This month's lessons are a pair of cases that show that, in the right combination, minor circumstances can have fatal consequences. In one instance, the deceased was carrying out a routine task he had probably performed countless times before. This time, however, the circumstances were such that the incident resulted in his death. The second case resulted from an individual's using a normally safe piece of gear in a manner other than that for which it was designed. Again, the result was death.

One evening in late spring a three-man crew (Coast Guard-licensed operator, deck utilityman, and deckhand) was moving a loaded freight barge from one area of a fleet to another on the Upper Mississippi River. At about 2200 the deckhand and utilityman boarded the barge from the towing vessel without telling the operator. Their intention was to prepare to secure the barge in its new position in the fleet. Rain had been falling, and a light drizzle was still coming down.

The barge was loaded with grain, and some wheat residue was covering the starboard deck area. Neither man was wearing a Personal Flotation Device (PFD), but the utilityman was wearing a yellow rain jacket. As he proceeded along the starboad walkway toward the bow of the barge, he fell overboard. As he fell, his flashlight attracted the attention of the operator, who shined the vessel's spotlights to the starboard side and turned on the vessel's bow/deck light.

The operator then requested that the deckhand keep the utilityman in sight while they maneuvered the barge into a nearby slip. While there were life rings on the vessel, no attempt was made to throw one to the utilityman. After taking care of the barge, they returned to where the utilityman had last been seen. A thorough search of the area by the towboat and other vessels which responded to a call for assistance failed to produce any trace of the lost utilityman. His body was recovered three days later.

This tragedy resulted from a combination of rather minor circumstances, none of which should have been fatal by itself:

1. The starboard walkway was covered with wheat residue. In itself, this may not have been too serious, but combined with the moisture from the earlier rain and drizzle it became quite hazardous.
2. The victim wore no PFD. This was careless but not in itself life-threatening.
3. The utilityman swam away from the barge after entering the water, and no attempt was made to throw him a life ring or line.
4. His body was still clad in the rain jacket when it was recovered.

The slippery deck surface led to the victim's fall overboard, and the absence of a PFD, compounded by the weight of the rain jacket, resulted in his being unable to remain afloat until help was rendered.

The second incident occurred as an undocumented industrial worker was painting the overhead of the engine room on a vessel. He was working from an aluminum ladder that had been secured horizontally between a handrail and the top of the diesel oil tank. The ladder broke and collapsed, causing him to fall nine feet to the deck. He was airlifted by helicopter to a hospital, where he died the following day without regaining consciousness.

Here an individual made improper use of a ladder which, although quite adequate for its intended function, simply was not designed to withstand the stresses the man placed on it by using it horizontally.

These cases again illustrate that whenever one attempts to shortcut safety, there is a risk of tragedy. While it may be successfully avoided many times, there is always the chance that the one particular combination of circumstances that will produce a casualty will occur. ⚓

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. By day, vessels over 20 meters in length fishing in International waters display

A. two black balls in a vertical line.
B. two black cones in a vertical line.
C. two baskets in a horizontal line.
D. one black ball.

REFERENCE: CG-169 Rule 26 (c)(i)

2. The service use of approved handheld rocket-propelled parachute red-flare distress signals shall be limited to a period of

A. six months.
B. one year.
C. two years.
D. three years.

REFERENCE: 94.90-5 CG-257

3. The deck beam brackets of a transversely framed vessel resist

A. hogging stresses.
B. sagging stresses.
C. racking stresses.
D. shearing stresses.

REFERENCE: Baker

4. "Combustible" means that an oil will

A. give off inflammable vapors only above 80° F.
B. give off inflammable vapors at or below 80° F.
C. give off inflammable vapors only above 150° F.
D. give off inflammable vapors at or below 150° F.

REFERENCE: American Merchant Seaman Manual

5. Which of the following statements does not apply to vessels operating in ice?

A. Course changes should not vary more than 45° from the base course.
B. A course toward a "water sky" should lead to light ice concentrations.
C. Speed can be determined by use of a Dutchman's log or radar.
D. More reliance can be placed on the magnetic compass than the gyro compass.

REFERENCE: Knight's

Corrections

The words "in a turn" were left out of Question 4 of the "DECK" Nautical Queries in the June 1982 issue. Also, the "GM" in answers B and C should have been "CG".

In question 5 of the "DECK" section of the June issue, the words "and periodically dried out" should be added to statement II.

ENGINEER

1. A sudden drop in compression pressure in one cylinder of a diesel engine can be caused by

A. a leaking fuel injector nozzle.
B. a clogged air filter.
C. excessively early fuel injection.
D. malfunctioning valves.

REFERENCE: Maleev

2. Ring-groove inserts are sometimes used on aluminum alloy pistons to

A. reduce the ring-groove wear rate.
B. seal against crankcase vapors.
C. lessen wear on aluminum parts of the cylinder.
D. allow for the greater expansion rate of aluminum.

REFERENCE: Stinson

3. In a single-acting, two-stroke-cycle diesel engine, the power impulse in an individual cylinder occurs

A. once every crankshaft revolution.
B. once every two crankshaft revolutions.
C. once every piston stroke.
D. twice every piston stroke.

REFERENCE: Stinson

4. Which statement is characteristic of precision-manufactured roller bearings?

A. They are not capable of maintaining alignment over long periods of time.
B. They have a relatively high power loss from friction.
C. They are well adapted to variable speed operation.
D. Their lubrication is complicated and requires constant attention.

REFERENCE: Osbourne

5. At dead center, the centerline of the connecting rod usually coincides with the

A. angularity of the piston motion.
B. inertia moment from the piston.
C. centerline of the cylinder.
D. centerline of the crankpin.

REFERENCE: Maleev

ANSWERS

DECK
1.B;2.D;3.C;4.A;5.D
ENGINEER
1.D;2.A;3.A;4.C;5.C

SS CHANCELLORSVILLE

Receives Award for Rescue

The saving of lives and property at sea has traditionally been the Coast Guard's "claim to fame." In a single year the Coast Guard receives 70,000 calls for assistance.

Although for most of these the Coast Guard responds on its own, circumstances sometimes dictate the need for outside assistance. One such instance occurred the evening of November 27, 1981, when the SS CHANCELLORSVILLE, a 586-foot tanker owned by Keystone Shipping Company of Philadelphia, rescued five men from the storm-beaten 39-foot sailing vessel TINA while en route to New York.

The TINA had left Bermuda the morning of November 23, heading for Brazil. Three days later, approximately 240 miles east of Bermuda, the TINA encountered heavy seas which caused the vessel to flood and become dismasted. The flooding resulted in lost power and left only the VHF radio operating.

It was not until the next morning that a Navy P-3 Orion heard the distress calls. Given the approximate position from which the calls were coming, the Coast Guard Operations Center in Bermuda contacted the CHANCELLORSVILLE, which had been assisting in a search 200 miles southeast of Bermuda, and requested that it assist the TINA.

Within barely eight hours, the CHANCELLORSVILLE located the TINA and brought the five men on it aboard. The interior of the sailboat was reported in very poor condition, and the boat was set adrift. Fortunately, the crew was in good condition and required no medical attention.

After an 8-hour search, the crew of this 586-foot tanker was able to rescue the 5-man crew of a 39-foot sailing vessel. Photo courtesy of Keystone Shipping Co.

On May 14, 1982, Captain John B. Ekman, Commanding Officer of the Coast Guard's New York Marine Inspection Office, commended the captain and crew of the CHANCELLORSVILLE while presenting them with a Certificate of Merit. Accepting the award for the crew were Mr. E. Dieterlea and Mr. Steven B. Gerke of Keystone Shipping. The certificate reads in part, "This Certificate of Merit is presented to the captain and crew of the SS CHANCELLORSVILLE in recognition of notable services which assisted greatly in furthering the aims and functions of the U.S. Coast Guard."

Where to Find Coast Guard Regulations

In the past, the Coast Guard provided the public with reprints of selected subchapters of the Code of Federal Regulations (CFR) free of charge. This was done to keep interested parties up-to-date on Coast Guard regulations. Because of high printing costs and tight budgets, this policy must be discontinued. The Superintendent of Documents of the U.S. Goverment Printing Office publishes the CFR in yearly updated form; the CFRs are thus now the best source for current Coast Guard regulations.

To order copies of the CFR, call (202) 783-3238 or write Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Information on the price and availability of any volume can also be obtained from that source.

Title 46 of the CFR, covering shipping regulations, is divided into nine volumes. When ordering, refer to the volume and parts desired as shown in the chart below. For example, if marine engineering regulations are needed, 46 CFR Parts 41 to 69 (Volume 3) should be ordered.

The chart also shows the old Coast Guard-numbered publications (no longer being printed) that are equivalent to the CFRs.

Current CFR Volume and Parts	Contains	Replaces
1. 46 CFR Parts 1 to 29	Subchapter A - Procedures Applicable to the Public (Parts 1 to 9)	No Coast Guard-numbered equivalent
	Subchapter B - Merchant Marine Officers and Seamen (Parts 10 to 16)	CG-191 Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel
	Subchapter C - Uninspected Vessels (Parts 24 to 29)	CG 258 Rules and Regulations for Uninspected Vessels
2. 46 CFR Parts 30 to 40	Subchapter D - Tank Vessels (Parts 30 to 40)	CG-123 Rules and Regulations for Tank Vessels
3. 46 CFR Parts 41 to 69	Subchapter E - Load Lines (Parts 42 to 46)	CG-176 Load Line Regulations
	Subchapter F - Marine Engineering (Parts 50 to 64)	CG-115 Marine Engineering Regulations
	Subchapter G - Documentation and Measurement of Vessels (Parts 66 to 69)	CG-177 Yacht Admeasurement and Documentation
4. 46 CFR Parts 70 to 89	Subchapter H - Passenger Vessels (Parts 70 to 89)	CG-256 Rules and Regulations for Passenger Vessels
5. 46 CFR Parts 90 to 109	Subchapter I - Cargo and Miscellaneous Vessels (Parts 90 to 106)	CG-257 Rules and Regulations for Cargo and Miscellaneous Vessels
	Subchapter I-A - Mobile Offshore Drilling Units (Parts 107 to 109)	No Coast Guard-numbered equivalent
6. 46 CFR Parts 110 to 139	Subchapter J - Electrical Engineering (Parts 110 to 139)	CG-259 Electrical Engineering Regulations
7. 46 CFR Parts 140 to 155	Subchapter N - Dangerous Cargoes (Parts 146 to 149)	CG-108 Rules and Regulations for Military Explosives and Hazardous Munitions
	Subchapter O - Certain Dangerous Bulk Cargoes (Parts 150 to 154)	No Coast Guard-numbered equivalent
8. 46 CFR Parts 156 to 165	Subchapter P - Manning of Vessels (Part 157)	CG-268 Rules and Regulations for Manning of Vessels
	Subchapter Q - Specifications (Parts 160 to 165)	No Coast Guard-numbered equivalent
9. 46 CFR Parts 166 to 199	Subchapter R - Nautical Schools (Parts 166 to 168)	No Coast Guard-numbered equivalent
	Subchapter T - Small Passenger Vessels (under 100 gross tons) (Parts 175 to 187)	CG-323 Rules and Regulations for Small Passenger Vessels
	Subchapter U - Oceanographic Vessels (Parts 188 to 196)	No Coast Guard-numbered equivalent
	Subchapter V - Marine Occupational Safety and Health Standards (Part 197)	No Coast Guard-numbered equivalent

Listed below are the Code of Federal Regulations (CFR) subchapters covering Coast Guard regulations on Navigation and Navigable Waters (Title 33, Chapter I of the CFR). Chapter I consists of a single volume containing 19 subchapters. Subchapters and/or parts of this chapter are not published individually; the entire volume must be ordered.

33 CFR Parts 1 to 199	Contains	Replaces
	Subchapter A - General (Parts 1 to 26)	No Coast Guard-numbered equivalent
	Subchapter B - Military Personnel (Parts 45 to 53)	No Coast Guard-numbered equivalent
	Subchapter C - Aids to Navigation (Parts 60 to 76)	CG-208 Aids to Navigation Regulations
	Subchapter D - International Navigation Rules (Parts 80 to 82)*	CG-169 Navigation Rules, International/Inland*
	Subchapter E - Inland Navigation Rules (reserved for future regulations)*	CG-169 Navigation Rules, International/Inland*
	Subchapter F - Interim Inland Navigation Rules (Parts 92 to 98)*	CG-172 Rules of the Road—Great Lakes* CG-184 Rules of the Road—Western Rivers*
	Subchapter G - Regattas and Marine Parades (Part 100)	No Coast Guard-numbered equivalent
	Subchapter H - Routes for Passenger Vessels (Part 105)	No Coast Guard-numbered equivalent
	Subchapter I - Anchorages (Parts 109 and 110)	No Coast Guard-numbered equivalent
	Subchapter J - Bridges (Parts 114 to 118)	No Coast Guard-numbered equivalent
	Subchapter K - Security of Vessels (Part 122)	CG-239 Security of Vessels and Waterfront Facilities
	Subchapter L - Waterfront Facilities: Security Zones and Regulated Navigation Areas (Parts 125 to 128)	CG-239 Security of Vessels and Waterfront Facilities
	Subchapter M - Marine Oil Pollution Liability and Compensation (Parts 135 and 136)	No Coast Guard-numbered equivalent
	Subchapter N - Artificial Islands and Fixed Structures on the Outer Continental Shelf (Parts 140 to 147)	CG-320 Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf
	Subchapter NN - Deepwater Ports (Parts 148 to 150)	No Coast Guard-numbered equivalent
	Subchapter O - Pollution (Parts 151 to 159)	No Coast Guard-numbered equivalent
	Subchapter P - Ports and Waterways Safety (Parts 160 to 165)	No Coast Guard-numbered equivalent
	Subchapter S - Boating Safety (Parts 173 to 183)	M16752.2 (old CG-497) Rules and Regulations for Recreational Boats**

* Sections of Title 33 of the CFR were altered to incorporate the new unified Inland Navigation Rules, which went into effect December 24, 1981. The only publication now needed for a complete listing of Navigation Rules is CG-169, Navigation Rules, International/Inland, a new edition of which will be available later this year from the Government Printing Office under the number COMDTINST M16672.2.

** This publication is still available from the Commandant (G-BBT-1), U.S. Coast Guard, Washington, DC 20593.

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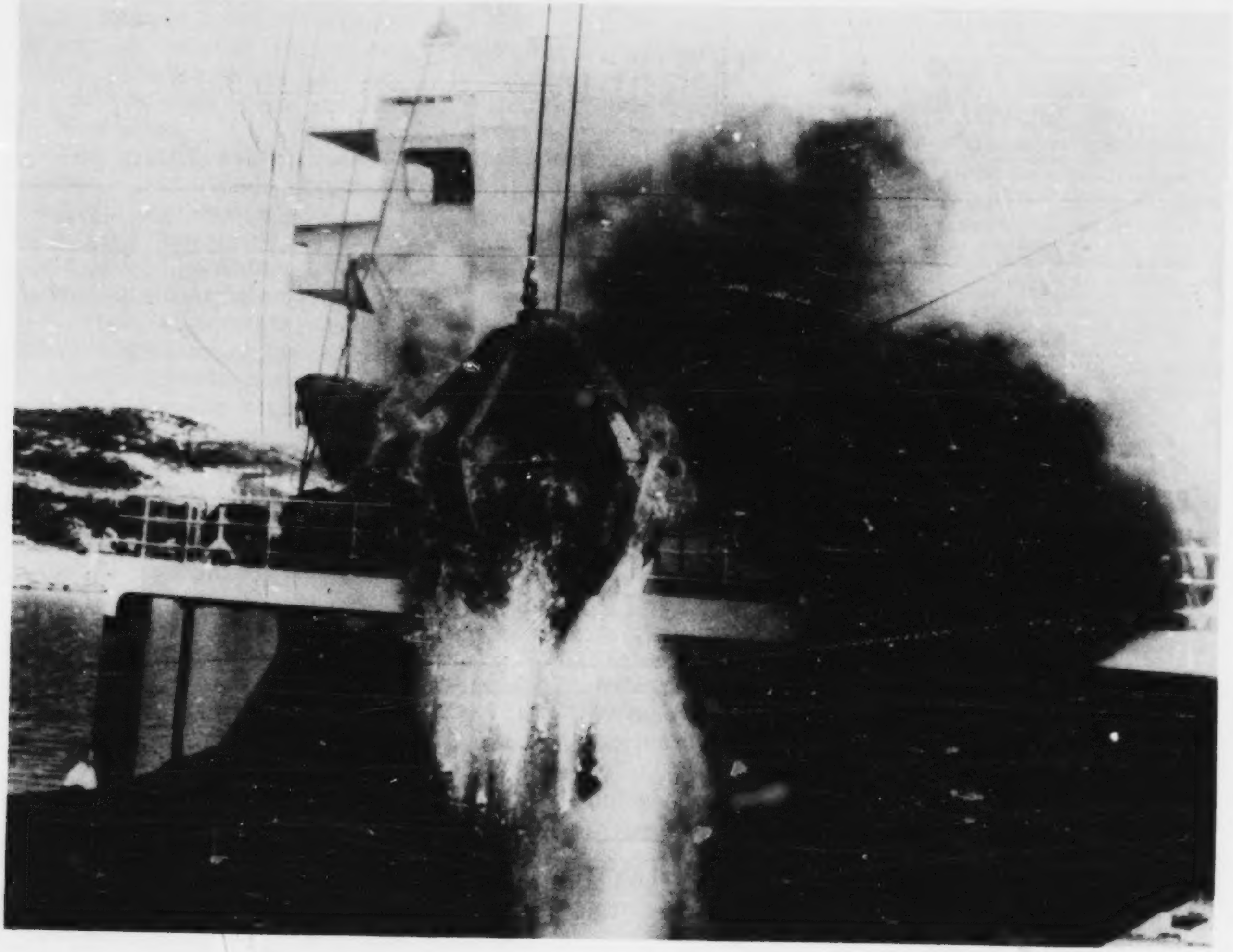

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Commandant

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cover

A metal fire on a ship is difficult to put out. In many cases, the only solution is to unload the cargo, as was done with the metal turnings shown here, carried by the M/V BRUNLA. Preventing such fires is a better solution. For more on metal fires and what can be done to prevent them, see "Too Many Fires in the Iron," beginning on page 275.

MarAd Opens New Fire Training Center

The Maritime Administration formally opened its new Merchant Seaman Fire Training Center at Swanton, Ohio, on August 11, completing a master plan to provide Federal firefighter schools for merchant mariners in all of the coastal/regional areas served by the agency.

The training center, located near the Toledo Express Airport, was dedicated in a 30-minute ceremony, which was followed by a marine firefighting demonstration. It will serve the eight-state Great Lakes maritime community--America's "Fourth Seacoast"—and also provide training to men and women who sail on inland waterways vessels in contiguous areas to the south.

The new center is the fourth in this country offering hands-on firefighting instruction to merchant seamen. MarAd opened a training facility in New Orleans in November 1980 and, jointly with the U.S. Navy's Military Sealift Command, provides similar training at Earle, New Jersey, and Treasure Island in San Francisco Bay.

In remarks prepared for the dedication, Howard A. Watters, Deputy Maritime Administrator for Inland Waterways and Great Lakes, U.S. Department of Transportation, hailed the opening day as a significant one "in the U.S. maritime industry's historic endeavor to safeguard the lives of sailors." Emphasizing the importance which the government, ship operators, and maritime labor attach to fire prevention and firefighter training, Watters said:

"In no other environment other than perhaps a crowded theater does the cry of 'Fire!' cause such great fear as the sounding of that alarm aboard ship. At sea there is no fire department to call. A ship's crew is on its own, and each crew must be trained to fight its own fires."

Three types of marine fires were scheduled in the training exercise Wednesday under the direction of the center's instructor, Carl Weatherburn—a simulated engine room fire, a galley fire, and a fire in an open tank filled with oil. Participating in the public demonstration were members of the first class to complete the school's 32-hour course in fighting shipboard fires. The center also offers a 16-hour course in the control of fires aboard barges. Each course devotes equal time to classroom instruction and field training.

The Ohio facility is unique among the four Federal schools in that it combines both types of instruction at the same location. The five fire simulators it uses in its hands-on training include a two-deck ship mock-up which simulates fires in the engine room, bilge, galley, and a living compartment.

MarAd Releases Updated Data Sheet

The Maritime Administration's U.S. Merchant Marine data sheet shows that, as of June 1, 1982, the privately-owned, deep-draft fleet of the U.S. merchant marine totaled 720 vessels with a record carrying capacity of over 24.7 million deadweight tons (DWT). The total comprises 577 ocean-going ships and 143 Great Lakes vessels.

Compared with the totals as of June 1, 1981, the number of ships in the U.S. fleet decreased by three vessels, but the fleet's capacity increased by 300,000 DWT. The gain in capacity reflects the larger sizes of vessels added to the fleet during the past 12 months and the comparatively small sizes of those retired from active service.

As of June 1, 1982, 35 merchant ships totaling more than 1.2 million DWT were under construction or on order in U.S. shipyards. The shipbuilding orderbook at that time consisted of 13 tankers, 6 intermodal carriers, 2 dry-bulk carriers, 9 tug/barges, 3 tanker barges, and 2 incinerator ships. Ten additional vessels were undergoing conversion.

Copies of a profile of U.S. maritime activity are available from the Office of Public Affairs, Maritime Administration, 400 Seventh Street SW, Washington, DC 20590.

The name of the author of "Pairing 'Schoolships' with Scholarship: SUNY Maritime College" was omitted from the July issue. The article was written by R. Thomas Cerny, Director of Admissions at the college since 1973. Mr. Cerny, who serves as an instructor during the summer sea terms whenever possible, is also a Commander in the Naval Reserve.

Texas A&M Announces Fall Schedule

The Texas Engineering Extension Service's Oil and Hazardous Material Control Training Division has announced fall sessions for courses of interest to mariners:

A five-day course on hazardous material control will be held at Brayton Firemen Training Field in College Station, Texas. The course is open to fire and safety personnel, contractors, petroleum and chemical industry representatives, and others who may be involved with hazardous materials. Participants will improve their response skills through classroom instruction, demonstrations, and hands-on exercises using the latest equipment and technology available for hazardous material control.

An oil spill control course will be held in Galveston. Students will practice working within the framework of the law and the capabilities of available equipment and manpower, learning how to maximize their effectiveness under various spill conditions and minimize spill damage and expense.

For information, call (713) 845-3418 or write to the Oil and Hazardous Material Control Training Division, Texas Engineering Extension Service, The Texas A&M University System, College Station, Texas 77843.

Ashland Marine Terminal Receives Safety Award

The Marine Repair Terminal of Ashland Petroleum Company was recognized recently for achieving 1 million employee hours without a lost-time accident. In a cermeony at Catlettsburg, Kentucky, Charles J. Luellen, President of Ashland Petroleum, presented the award to Edwin A. Burke, terminal manager.

The million-hour record required seven years and nine months of accident-free work, often under adverse conditions.

The Marine Repair Terminal provides a wide range of services to Ashland's fleet of towboats and barges, including tank barge cleaning, welding repairs, and pump and engine repairs. The group consists of 62 employees.

The terminal received the National Safety Council's "Award of Commendation" in 1979 and 1980 and in 1978 received the "Award of Honor" for the best record for small shipyards.

Ashland Petroleum Company is an operating division of Ashland Oil, Inc. The Marine Repair Terminal is located on the Ohio River in Ashland, Kentucky.

Fifth Radar School Transferred by MarAd

A Seattle, Washington, radar training school, the last of five operated by the Maritime Administration, has been transferred to the Masters, Mates and Pilots (MM&P)-Maritime Advancement Training, Education and Safety (M.A.T.E.S.) Program.

In announcing the transfer, Maritime Administrator ADM Harold E. Shear, USN (Ret.), noted that the action carried out President Reagan's policy of returning government operations to the private or local/state sectors whenever it is practical to do so. The radar training schools previously transferred by MarAd are located in New York, New York, San Francisco, California, Toledo, Ohio, and New Orleans, Louisiana.

M.A.T.E.S. is an industry-financed organization which administers training and safe-

Ashland Marine Terminal manager Edwin A. Burke accepts a safety award on behalf of his 62 employees, who recently hit the 1 million mark in hours worked without a lost-time accident.

Jerry Williams, head of the Engine Department at Great Lakes Maritime Academy, which hosted the Lake Carriers' Association's QMED seminar on pumps and safety, explains the operation of a pump to seminar participants.

ty programs in accordance with terms of collective bargaining agreements between the MM&P and steamship operators. It assumed operation of the Seattle school under terms of an agreement which requires the organization to continue U.S. Coast Guard-approved courses in collision-avoidance navigation radar for 36 consecutive months. When that commitment is met, the M.A.T.E.S. Program will receive full title to the school's equipment, including marine radar units utilizing electronically simulated visual displays. The agreement specifically provides that the radar school be open to all qualified mariners on equal terms regardless of union affiliation.

The Seattle facility provides training annually to about 230 deck officer personnel. The courses offered prepare officer candidates and licensed deck officers for original qualifications as Radar Observer or renewal by the Coast Guard of Radar Observer endorsements on their merchant marine deck officer licenses.

Lake Carriers' Association Holds Courses

The Lake Carriers' Association, based in Cleveland, Ohio, recently completed sessions of its wire splicing and pump schools. The first, an intensive 20-hour course in marlinspike seamanship, covered life raft test and inspection, nomenclature of deck equipment and fittings, and fibre line and wire-rope splicing. The second, a three-day course on the engineering principles involved in safely moving a fluid from one place to another at high volume or pressure, concentrated on lifesaving and firefighting equipment, pump operation, and troubleshooting and repair.

Future courses are planned on such subjects as paints and coatings, deck machinery troubleshooting, basic electrical theory, and preparation for Coast Guard inspection. Inquiries should be sent to Captain J. A. Wilson, Director of Training, Lake Carriers' Association, 1411 Rockefeller Building, Cleveland, Ohio 44113.

New Reporting Service Established

The Marine Operations Reporter, published monthly by Maritime Advisory Services, Inc. (MASI), New York, is a new information service that monitors, digests, and reports on enacted and proposed changes in U.S. maritime regulatory policy.

This professional reporting service is targeted at shipowners, operators, and agents, tug and barge lines, port and terminal operators, naval architects, marine engineers and equipment manufacturers, oil and gas exploration companies, maritime lawyers, marine surveyors and consultants, shipbuilders, and marine service companies. It reviews all current regulatory activity, including dates of regulatory hearings which interested parties may attend, and cross indexes related regulations. The *Reporter*, which is published in three-ring binder format for easy updating and referencing, also includes special color-coded markers for updating copies of the Code of Federal Regulations.

The annual subscription price of *The Marine Operations Reporter* is $250. Further information and a sample

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COAST GUARD

A FLIR-equipped helicopter can conduct searches successfully even at night or during times of low visibility.

issue will be sent to qualified inquirers upon request to MASI, Suite 3147, One World Trade Center, New York, New York 10048.

Searching for Small Targets with FLIR

As reported in the cover story of the May 1982 issue of the *Proceedings*, the Coast Guard's Office of Research and Development has been evaluating the Forward Looking Infrared (FLIR) sensor for use in search and rescue missions. FLIR senses heat variation in objects and converts this into an image on a TV screen. Because FLIR is sensitive to heat and not light, its performance during low visibility and nighttime is as good as (and often better than) its performance during clear daytime conditions. FLIR is to be used primarily aboard the new Coast Guard HH-65A Short Range Recovery (SSR) helicopter.

During the fall of 1981, the Coast Guard Research and Development Center conducted experiments with a helicopter-mounted FLIR to test its ability to detect 15-to 19-foot boats, 4-and 7-man life rafts, and persons in the water. The FLIR was able to detect 60 to 90 percent of the boat and life raft targets in its field of view over the range of test conditions. Probability of detection of persons in the water was as high as 70 percent (except when white caps and rough sea conditions were present, when it dropped severely). Based on these results, the Coast Guard has concluded that FLIR exceeds all its other sensors in nighttime detection and classification of small, passive targets.

Copies of the project report, "Preliminary Assessment of U.S. Coast Guard Short Range Recovery (SSR) Forward Looking Infrared (FLIR) System Small Target Detection Performance," Coast Guard Technical Report No. CG-D-20-82, can be obtained from the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Ship Safety Achievement Awards Announced

The American Institute of Merchant Shipping recently announced the names of winners of the Ship Safety Achievement Awards.

The officers and crew of Delta Steamship Lines' SS DELTA NORTE received top honors for successfully extinguishing a serious fire under adverse weather conditions, thereby preventing loss of life, vessel, and cargo. The firefighting operation took place in the Atlantic Ocean off the coast of South America on May 15, 1981.

The officers and crew of the Military Sealift Command's USNS RIGEL received top honors for repairing and dewatering a flooded vessel under adverse weather conditions. The rescue operation took place in the Indian Ocean on September 6, 1981. A second MSC vessel, the USNS SOUTHERN CROSS, was also honored. The SOUTHERN CROSS received a Commendation for its humanitarian assistance to Vietnamese refugees adrift in the South China Sea during late September 1981.

The officers and crew of Sonat Marine, Inc.'s DRIVER were presented with a Citation of Merit for going to the assistance of a sinking vessel and rendering emergency first aid. The rescue operation took place in the Chesapeake Bay on December 23, 1981.

The Ship Safety Achievement Awards are presented jointly by the American Institute of Merchant Shipping and the Marine Section of the National Safety Council in recognition of feats at sea where outstanding seamanship and effort on the part of everyone on a vessel are factors in saving lives or averting disaster.

1982 Editions of Port Series Reports Available

The Water Resources Support Center of the U.S. Army Corps of Engineers has announced publication of the 1982 editions of three of its Port Series Reports.

The reports in the Port Series describe the principal United States deep-draft ports. They consist of complete listings of a port's waterfront facilities, including information on berthing facilities, petroleum and coal-handling terminals, grain elevators, warehouses, cranes, transit sheds, marine repair plants, fleeting facilities, and floating equipment. Maps, which are overlaid on aerial photographs of the waterfront areas, show the location of the described facilities.

Port Series Report No. 14, describing the ports of Savannah and Brunswick, Georgia, can be ordered for $7. Report No. 60, describing Pittsburgh and ports on the Ohio, Monongahela, and Allegheny Rivers, Pennsylvania, is the first in the series devoted to the nation's inland ports. Copies of this report may be obtained for $11. Report No. 72, covering the ports of Natchez, Vicksburg, and Greenville, Mississippi, and ports on the Mississippi River Miles 255 - 620 AHP, is priced at $7.50.

Orders should be addressed to Port Series Reports (WRSC-CP), Kingman Building, Fort Belvoir, Virginia 22060 and should include a money order or check (in U.S. funds) payable to the Superintendent of Documents. Payment in advance is required for all purchases. Telephone orders will be accepted from holders of Superintendent of Documents Accounts or Interbank Credit Cards (Master Charge or Visa only).

Coast Guard Officer Wins Boating Safety Award

Captain William J. Brogdon of Yarmouth, Maine, has won the sixth annual Captain Fred E. Lawton Boating Safety Award.

When not on duty directing Coast Guard operations in southern Maine, Captain Brogdon is an active recreational boatman and free-lance writer. He is a regular contributor to boating magazines such as *Motorboating & Sailing*, *Boating*, and *Salt Water Sportsman*.

During the past year, his articles of helpful advice to boaters included a series on practical navigation and explanatory pieces on the new Rules of the Road, outboard fueling, aids to navigation and night piloting, collision avoidance, distress communications, and boat handling through dangerous inlets.

Runner-up in this year's contest was Jim Martenhoff, Miami boating writer, editor, and columnist for *Salt Water Sportsman*. His 1981 work included an introduction to small-boat navigation for sport fishermen and articles on visibility and the importance of maintaining a proper lookout, interpreting wind and weather, lightning protection, using a marine radiotelephone, and selecting dependable engines.

The award is sponsored by Raytheon Company and is named for its late director of marine safety. The winners were selected by a panel of 22 judges from publications, broadcasting, and boating safety organizations.

Entries describing contributions during the current year will be accepted until December 31, 1982. ⚓

One of a pair of Waterford crystal decanters won by Captain William J. Brogdon, Jr., center, is admired by Mrs. Brogdon at a ceremony honoring her husband. D. Brainerd Holmes, right, President of Raytheon Company, also presented Captain Brogdon with a certificate and a $500 honorarium.

Keynotes

The following items of general interest were published in the FEDERAL REGISTER between June 21, 1982, and August 16, 1982:

Final rules: CGD 09-82-18 Queen Beatrix Regatta, Lake Macatawa, Holland, Michigan, June 21, 1982. CGD 82-039 Inland Waterways Navigation Regulations, June 21, 1982. CGD 82-038 Coast Guard Areas, Districts, Marine Inspection Zones, and Captain of the Port Zones, June 21, 1982. CGD 78-128 Safety Rules for Self-propelled Vessels Carrying Hazardous Liquids, Correction, June 24, 1982. CGD 80-107 Documentation of Vessels, June 24, 1982 *(see page 7 of the January 1982 issue of the* Proceedings). CGD 13-82-07 Columbia Cup Unlimited Hydroplane Race, Columbia River, July 1, 1982. CGD 09-82-05 Joe Gimbrone Memorial Regatta, Niagara River, July 1, 1982. CGD 82-072 Editorial Name Change, July 1, 1982. CGD 79-034 Regulated Navigation Areas and Limited Access Areas, July 8, 1982. CGD 05-81-15R Anchorage Regulations; Annapolis Harbor, Annapolis, Maryland, July 8, 1982. CGD 80-147 Drawbridge Operation Regulations; Gulf Intracoastal Waterway, Houma Navigation Canal, Houma, Louisiana, July 19, 1982. CGD 81-107 Drawbridge Operation Regulations; Snohomish River, Steamboat Slough, East Slough, Washington, July 22, 1982. CGD 13-82-08 Water Festival Regatta, Willamette River, July 22, 1982. CGD 82-077 Safety and Security Zones, Quarterly List, August 2, 1982. CGD 07-82-02 Drawbridge Operation Regulations; Gulf Intracoastal Waterway, Clearwater, Florida, August 2, 1982. CGD 09-82-21 Coral Gables Challenge Cup, August 2, 1982. CGD 09-82-02 1982 Cleveland National Airshow, August 5, 1982. CGD 09-82-23 St. Joseph Venetian Festival, St. Joseph (Michigan) River, August 5, 1982. CGD 09-82-20 1982 Hydro National Championship, Niagara River, August 5, 1982. CGD 09-82-04 Special Anchorage Area at Fish Creek Harbor, Fish Creek, Wisconsin, August 16, 1982. CGD 82-020 Fleeting Facilities: Towboat Attendance of Barges, August 16, 1982. CGD 80-107 Documentation of Vessels, Correction, August 16, 1982. CGD 82-023 Casualty Reporting Requirements; interim final rule, August 16, 1982.

Notices of proposed rulemaking (NPRMs): CGD 08-82-01 Drawbridge Operation Regulations; Gulf Intracoastal Waterway, Algiers Alternate Route, Algiers, Louisiana, June 24, 1982. CGD 82-025 Drawbridge Operation Regulations of the Navigable Waters of the United States, July 9, 1982. CGD 81-080(A) Shipping Safety Fairways, Amendments and Additions, July 19, 1982. CGD 08-82-02 Anchorage Regulations, Lower Mississippi River, Louisiana, July 22, 1982. CGD 79-180 Disclosure of Safety Standards and Country of Registry, August 2, 1982. CGD 07-82-09 Drawbridge Operation Regulations, Lake Worth, Atlantic Intracoastal Waterway, Palm Beach County, Florida, August 2, 1982. CGD 82-074 Applications for Processing Bridge Permits, August 5, 1982. CGD 82-046 Regulated Navigation Area; San Pedro Bay, California, August 9, 1982. CGD 82-069 Casualty Reporting Requirements, August 16, 1982. CGD 81-081 Electronic Position Fixing Devices, August 16, 1982.

Notices: CGD 82-066 Notice of Small Vessel Towing and Salvage Policy Study; Request for Comments, July 21, 1982. CGD 82-057 Port Access Route Study, Notice of Study Results, Southern California, July 24, 1982. CGD 82-070 Port Access Route Study, Notice of Study Results, Fifth Coast Guard District, July 22, 1982. CGD 82-078 Notice of Study of Short Range Aids to Navigation Program of the United States Coast Guard, August 5, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Berwick Bay Vessel Traffic Service (CGD 73-186)

The Coast Guard published an NPRM on August 16, 1982, proposing establishment of a Vessel Traffic Service (VTS) at Berwick Bay (Morgan City, Louisiana) similar to the one presently operating under a Coast Guard order. These regulations would require all vessels to comply with certain vessel traffic directives. The proposed regulations are intended to prevent collisions, rammings, and groundings and to protect the area from the environmental damage which can result from such accidents.

For further information contact Ed LaRue, U.S. Coast Guard (G-WWM-2), Washington, DC 20593; (202) 426-4958.

Subdivision and Stability Regulations
(CGD 75-023)

The subdivision and stability regulation are currently spread among different parts of Titles 46 and 33 of the Code of Federal Regulations. On August 16, 1982, the Coast Guard published an NPRM proposing that these regulations be gathered into a newly created Subchapter S of Title 46. This would make the regulations easier to understand and apply.

For further information contact LCDR Kevin Feeney, U.S. Coast Guard (G-MTH-5), Washington, DC 20593; (202) 426-2187.

Cargo Transfer Procedures Manual for Tank Vessels
(CGD 75-148)

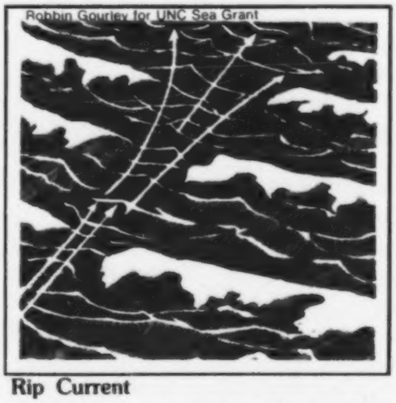
The Coast Guard has withdrawn its proposal to require tank vessels to carry and use a manual of cargo transfer procedures. This rule would have implemented a National Transportation Sefety Board recommendation that all chemical tank vessel operators be required to keep up-to-date operating manuals on board showing proper operation of piping systems for anticipated transfer operations. The existence of regulations similar to this proposal makes further rulemaking unnecessary. A notice terminating the rulemaking was published July 19, 1982.

For further information contact CDR David Strasser, U.S. Coast Guard (G-MVI-2), Washington, DC 20593; (202) 426-2190.

Shipping Papers for Foreign-flag Tank Vessels
(CGD 76-081)

The Coast Guard is terminating its proposal to require foreign-flag tank vessels to carry shipping papers on board while in U.S. waters. This proposal was found to be a duplicate of an existing requirement in Title 19 of the Code of Federal Regulations. A notice of termination was published July 19, 1982.

For further information contact CDR David Strasser (same address as in preceding Keynote).



Robbin Gourley for UNC Sea Grant

Rip Current

TAKE THE EASY WAY OUT

A break in the wave pattern, a discoloration in the water. Sharp-eyed swimmers often can spot and avoid a rip current, the strong, narrow outflow of ocean water that carries back to sea the water brought in by waves.

If you're caught in such a current, don't panic. They're seldom more than 10 to 20 feet wide. Swim across the current, parallel to the beach and you'll be out of danger soon.

Or relax and let the current carry you seaward to the riphead, where it slows down. Then you can swim ashore parallel to the rip current but outside its seaward pull.

Don't fight a rip current. Take the easy way out.

A public service message from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Removal of New York Vessel Traffic Service Regulations
(CGD 77-087)

On August 2, 1979, the Coast Guard published a rule establishing operating procedures for the New York Vessel Traffic Service. The rule was scheduled to become effective on September 18, 1979. Certain necessary equipment proved difficult to obtain, however, and the effective date of the rule was delayed indefinitely. The Coast Guard has found it necessary to suspend the New York VTS, and on August 5, 1982, a rule was published removing the New York VTS regulations from the Code of Federal Regulations.

For further information contact LT J. S. Burnett, U.S. Coast Guard (G-WWM-1), Washington, DC 20593; (202) 426-1940.

Deepwater Port Liability Fund
(CGD 79-158)

The Deepwater Port Liability Fund will provide for settlement, without fault, of claims for cleanup costs and damages incurred as a result of oil spills from deepwater port activities. The interim final rule for this rulemaking was published on June 24, 1982. The regulations detail the policies, procedures, and administrative practices for overall management and operation of the fund.

For further information contact Frank Martin, U.S. Coast Guard (G-WP-5), Washington, DC 20593; (202) 472-5052.

Regional Examination Centers Established (CGD 82-033)

Because of budgetary considerations and personnel restrictions, the Coast Guard can no longer administer the licensing and certificating of seamen at every location of an Officer in Charge of Marine Inspection (OCMI). Instead, the Coast Guard has established 16 Regional Examination Centers (RECs) to perform these functions. The RECs will be located in:

Boston
New York City
Baltimore
Charleston, South Carolina
Miami
New Orleans
Houston
Memphis
St. Louis
Toledo, Ohio
Long Beach, California
San Francisco
Seattle
Anchorage
Juneau
Honolulu

In addition, Traveling Examination Teams (TETs) will be formed to administer exams in areas not close to RECs where a sufficient group (usually 10) exists in one place (such as a school) to merit travel to that area. Processing of applications and renewals will be done by mail to save time and money for those involved with the licensing process.

For further information on the final rule, published July 1, 1982, contact CDR Scott D. McCowen, U.S. Coast Guard (G-MVP-5/14), Washington, DC 20593; (202) 426-2240.

Actions of the Marine Safety Council

The Marine Safety Council considered the following regulatory projects in July and August:

CGD 77-084 Licensing of Pilots

This is an existing project which was proposed in 1981. Following a series of hearings, the project was rewritten extensively. The Council has decided to extend the scope of the rewritten proposal to address the issue of pilot qualifications for different levels of service. The Council supports the concept that pilot licenses be divided into categories according to the size of the vessel being controlled. The larger vessels, naturally, would require a higher level of qualification.

CGD 81-051 Charges for Coast Guard Aids to Navigation

This project would allow the Coast Guard to revise the fees charged for Aids to reflect their true cost. The cost tables have not been updated since 1967.

CGD 82-069 Casualty Reporting Requirements

The Council approved a work plan which proposes eliminating the costs of salvage, gas freeing, and drydocking from the $25,000 reporting threshold for property damage. The rationale for this change is that these costs actually are not indicative of the amount of damage that a vessel has suffered. The purpose of the monetary threshold is to exclude casualties of no great consequence from reporting requirements. The expenses described above could inflate the cost of repair beyond the reporting threshold, resulting in inaccurate statistical data on the severity and frequency of accidents.

CGD 82-075 Exposure Suits for MODUs, Offshore Supply Vessels, and Other Oceangoing and Coastwise Vessels

This project would require the vessels listed in the project title to carry approved exposure suits when they are operating in designated (cold) waters. With the exception of MODUs, vessels using enclosed lifeboats would be exempted from the requirement to carry the suits. In addition, the proposal would allow certain classes of vessels to carry the suits in lieu of life vests. The suits are as buoyant as vests and afford greater protection against hypothermia. ⚓

Please enclose your mailing label when sending in a change of address. Allow eight weeks for change to take effect.

The End of the Seasick Blues

by CDR A. M. Steinman
Chief, Special Medical Operations Branch

This article is addressed to all those crewmen who, for some reason, think that seasickness is a problem that's "all in your head," and that the medications to prevent seasickness are nothing but sugar and water. There are even some people who think that there is something "unmacho" about having to take anti-seasickness medications or that "experienced sailors don't get seasick."

Let me set the record straight. It is a medical fact of life that anyone will get seasick under the right conditions. This has been demonstrated over and over again at a United States Navy medical laboratory in Pensacola, Florida. The Pensacola facility performs research on motion sickness using a special rotating room which can simulate any desired degree of pitch, roll, and yaw. Technicians there often encounter swaggering, macho-type personnel who can bench-press a Volkswagen, do one-handed push-ups with refrigerators on their backs, exude the "right stuff" from every pore, and claim they can't be made seasick. A few minutes in the rotating room is about all it takes to reduce the "macho man" to heaving jelly. So much for seasickness being unmacho. Now as for the notion that seasickness is "all in your head" (meaning it's only a psychological problem and not a "real" problem)--baloney! Seasickness is caused by overstimulation of the vestibular apparatus of your inner ear, which sends nerve impulses along the eighth cranial nerve to your brain and initiates nausea and vomiting. In other words, it's a real, physical problem, not some imagined psychological phenomenon seen only in the fainthearted. So it doesn't make any sense to scoff at your shipmates for getting seasick, any more than it would to scoff at them for getting the flu.

OK, you say, so what if I admit to being seasick? What can you do to cure it? Granted, common remedies such as fresh air, soda crackers, watching the horizon, and sucking on lemons provide little lasting relief. Even modern medicine has been remarkably unsuccessful in curing and preventing this age-old malady; traditional medications are only partially effective and may leave you feeling drowsy.

An end to *mal de mer* may be on the way, however. Recent medical research has shown that a combination of two drugs is by far the most effective treatment available for preventing seasickness. These two drugs (neither of which, incidentally, works well by itself) are "promethazine" (an anti-histamine) and "ephedrine" (a common decongestant). For maximum effectiveness the medications should be taken one to two hours before you get underway and at six-hour intervals as needed thereafter. The dose is 25 mg. of each. Promethazine and ephedrine should be available from your ship's doctor.

The medications just described are effective; they work for the majority of people. Many crewmen are reluctant to use the medications, however, because they are afraid to let the master or their shipmates know they need them. And so these individuals go out on ships or boats, get sick, and become incapacitated or perform in a sub-par manner. This is obviously not what is expected from professional sailors. If you know you are prone to seasickness, by all means take advantage of the available anti-motion-sickness medication. You're no help at all to your shipmates if you're leaning over the rail half the time. I speak from personal experience—I've been there. I used to get seasick. Not anymore, though—now I take advantage of the available medications. I can't afford to be seasick. I don't really care whether anyone knows I get seasick and that I require medications to prevent it. My major concern is putting out my best effort. I hope you feel the same way.

There are a few people for whom the anti-seasickness medications do not work. They either get seasick despite the medications or suffer from the side effects (drowsiness, etc.) of the medications. A new anti-motion-sickness drug has recently been marketed which seems to work for some of these people. This drug is contained in a small patch which is worn behind the ear, and the medication is slowly absorbed through the skin. The chemical name of the drug is scopolamine. This medication, too, has side effects (dryness of mouth, drowsiness, etc.), and they may appear more frequently than those of the other drugs. However, some people who get no relief or experience side effects after taking the most commonly prescribed medications have reported good results with the topically applied scopolamine.

I hope that after you've finished reading this article you'll feel a little less hesitant about seeking relief from a malady that's been around as long as there have been ships on the sea. There's no need to feel embarrassed about getting seasick. You should feel embarrassed, however, if you are letting seasickness interfere with your performance, especially when the means exist to prevent it. ⚓

Maritime Medical Advice Offered by Commercial Firms

Several commercial sources for medical advice at sea have been established, and others may be created in the future. These companies, operating on a nationwide or local basis, generally provide medical advice to ships at sea which subscribe to their services. Normally, these companies inform their subscribers that they should contact the Coast Guard as a last resort if commercial stations are unreachable and/or busy.

The companies, their addresses, and telephone numbers are as follows:

GEOMET TECHNOLOGIES, INC.
1801 Research Boulevard
Rockville, MD 20850
(301) 424-9133

MARMEDIC, INC.
1770 Tchoupitoulas
New Orleans, LA 70130
(504) 529-3088

MEDICAL ADVISORY SYSTEMS, INC.
Box 193
Chaneyville Junction
Owings, MD 20736
800-368-2110

"THINK GREEN"

Over the next six years, the Coast Guard will be making changes in about one-third of its aids to navigation. Most of these changes, which will bring the U.S. system into line with a new worldwide buoyage system, had been planned independently by the Coast Guard.

Black buoys are to be changed to green. In 1980 - 1981, green buoys were tested in 19 sites selected across the U.S. to cover as many types of water conditions, visual backgrounds, and classes of users as possible. The tests showed that a dark green buoy could be identified as green (rather than some other color) from farther away than a black buoy could be identified as black. Early color identification is, of course, very important for an aid to navigation.

Green buoys have gained wide acceptance in Europe, primarily because of their high visibility against marine surroundings. The U.S. had adopted and implemented green as the color for port-hand daymarks by 1973, and Congress in 1976 passed Public Law 94-546, "allowing changes in colors of buoys based on improved technologies." Making port-hand buoys the same color as daymarks and lights will give mariners a logical, consistent system.

A second change to be carried out involves mid-channel buoys. These, which until now have been vertically striped black-and-white, will henceforth be vertically striped red-and-white. Black-and-white, the color scheme used to camouflage men-of-war in World War I, is difficult to see, especially when a buoy is spotted with ice or sea-gull guano. A red-and-white mid-channel buoy has been tested at the mouth of the Mississippi River and has been well received by mariners. The new color combination has proved to be so effective that, during its first year on station, the aid was rammed only once every three months, rather than once every month as it had been when it was black-and-white.

In addition to making the changes just described, the Coast Guard will be replacing the white lights on lateral aids with red and green lights.

Not surprisingly, the changes planned by the Coast Guard to give mariners better signals and improve navigation safety fall in line with the provisions of the worldwide buoyage system recently agreed upon by the International Association of Lighthouse Authorities (IALA). On April 15 most of the maritime nations of the world signed an agreement to modify their buoyage systems to conform to one basic system with several optional features.

The signing ceremony for the International Association of Lighthouse Authorities Maritime Buoyage Agreement was held April 15, 1982, in the dignified atmosphere of the Maison de l'Amérique Latine in Paris, France. RADM Richard A. Bauman, the Chief of the Coast Guard's Office of Navigation, signed for the United States. Twenty-four other maritime nations were present for the official signing, and an additional 19 nations entered into the agreement by deposit of their declaration with the Secretary General of IALA. Mr. H. Nagaoka, Director General of the Aids to Navigation Department in Japan's Maritime Safety Agency and President of IALA, called the signing of the Buoyage Agreement "not only a remarkable achievement in the history of the Association but also one of the most outstanding accomplishments in the development of safety of navigation all over the world."

History of Maritime Buoyage Practices

As recently as 1976, more than 30 different buoyage systems were in use around the world. This meant that the mariner had to learn many different systems, and the potential for confusion and accidents was great.

Over the long history of vessel navigation, maritime buoyage practices were established on a local basis. In different areas of England, for instance, local marking practices developed independently of one another. According to an unsubstantiated story, the U.S. custom of "red right returning" was brought back 130 years ago from Liverpool—what the U.S. didn't realize was that Liverpool was the only European port using that system.

Efforts to unify the world's buoyage systems date back as far as 1889, when several nations agreed to follow the British practice of placing black can buoys on the port side of channels and red conical buoys on the starboard side. Unity reigned briefly, however, lasting only until lighthouse authorities began putting lights on buoys. Some countries decided to put red lights on the port-hand buoys, apparently to conform with the practice of some local harbor authorities of marking the port side of harbor entrances with red lights. Other countries, logically enough, decided to put red lights on red starboard-side buoys.

Over the years, two different marking systems founded on unrelated principles were developed. Under the lateral system (at present, the U.S. uses this system exclusively), the port and starboard sides of a recommended route are marked in accordance with an agreed-upon direction based on flood currents (the color, shape, number, and lighting of the buoys serve as a guide to the mariner). Under the cardinal system, buoy colors and markings indicate the compass quadrant of deepest water or safe passage around a danger and, in some cases, draw attention to a feature in the vicinity of the buoy. The cardinal system is particularly useful in the open sea, where the direction of buoyage might not be obvious.

The most successful past attempt at unification was made by the League of Nations, which in 1936 proposed an "Agreement for a Uniform System of Maritime Buoyage." This agreement recommended red to port on lateral aids. World War II, however, intervened, and the proposal was scuttled.

The International Association of Lighthouse Authorities was founded in 1957. IALA is a non-governmental association bringing together in a working forum the services and organizations responsible for aids to navigation in the 80+ member nations. In 1965 it established a technical committee to study the changes and additions necessary for buoyage system unification. Lacking a strong mandate from the world community for rapid change, however, the committee made no real progress toward a simplified marking system. It took a series of accidents in the Straits of Dover in 1971 to bring about the necessary breakthrough.

Compromise was a key factor in the negotiations leading to the agreement to harmonize the world's buoyage systems. Initial proposals were for worldwide adoption of the red-to-port lateral system. The United States, with its almost 50,000 Federal and 40,000 private aids, and Canada, with its 30,000 aids to navigation, were urged to completely change their color systems and abandon red-to-starboard for the European and Asian red-to-port. Ten years of negotiation, planning, and compromise ensued. The Western Hemisphere's concession to use green rather than black on port-hand inbound buoys was matched by the Eastern Hemisphere's agreement to use conical (nun) buoys to starboard and cylindrical (can) buoys to port. The Eastern Hemisphere's concession makes lateral shape identification universal.

Stimulus for Agreement

In early 1971, the tanker TEXACO CARIBBEAN collided with another ship and sank near Varne Bank in the English Channel. A buoy tender was dispatched promptly to install wreck marks and to stand by to warn traffic of the wreckage. Within a few hours, the BRANDENBURG, a West German cargo carrier, misinterpreted the tender's signals, struck the wreck, and sank. A few weeks later, the Greek freighter NIKI also hit the sunken wreck and sank, killing all on board, although by this time a lightship was on station and several wreck buoys had been installed. In the following weeks there were many narrow misses as vessels avoided disaster only after warning flares were fired from the two lightships then in attendance. Fourteen wreck buoys were installed. These events, played out in such a short period in one of the world's most heavily traveled straits, provided a dramatic example of the confusion that could result from authorities' inability to mark a hazard in a way all mariners could understand.

Responding to these disasters, the International Maritime Organization (then the Inter-Governmental Maritime Consultative Organization) proposed formulation of a joint IMCO/IALA Committee on the International Unification of Buoyage Systems. It soon became clear that the stalemate over lateral colors (the European nations wanted to have red buoys to port when returning from sea, and the nations in the Western Hemisphere wanted to maintain "red right returning") would continue to bar the way to total unification.

In 1975 IALA announced that the term "unification" would be dropped in favor of "harmonization." This cleared the way for eventual agreement on a single system with two regional variations. *(See accompanying map)* Region A is red to port, and Region B is red to starboard. For both regions, the IALA Maritime Buoyage System can be thought of as a catalogue or inventory of lateral markings, cardinal markings, and safe water and special marks. Individual lighthouse authorities may choose to use any or all of these, as they see fit. The only difference between Region A and Region B is which color is to port and which color is to starboard. The meaning of all other color markings and all shapes and rhythms are identical for both regions.

Europe, Australia, New Zealand, Africa, the Persian Gulf countries, and most of Asia chose to be in Region A. Implementation of the rules developed for the red-to-port region began in 1977, were amended in 1980, and should be completed in 1985.

The U.S., along with the other countries of North, Central, and South America, Japan, the Republic of Korea, and the Philippines chose to be in Region B. Rules for the red-to-starboard region were completed in 1980, and implementation is only now beginning.

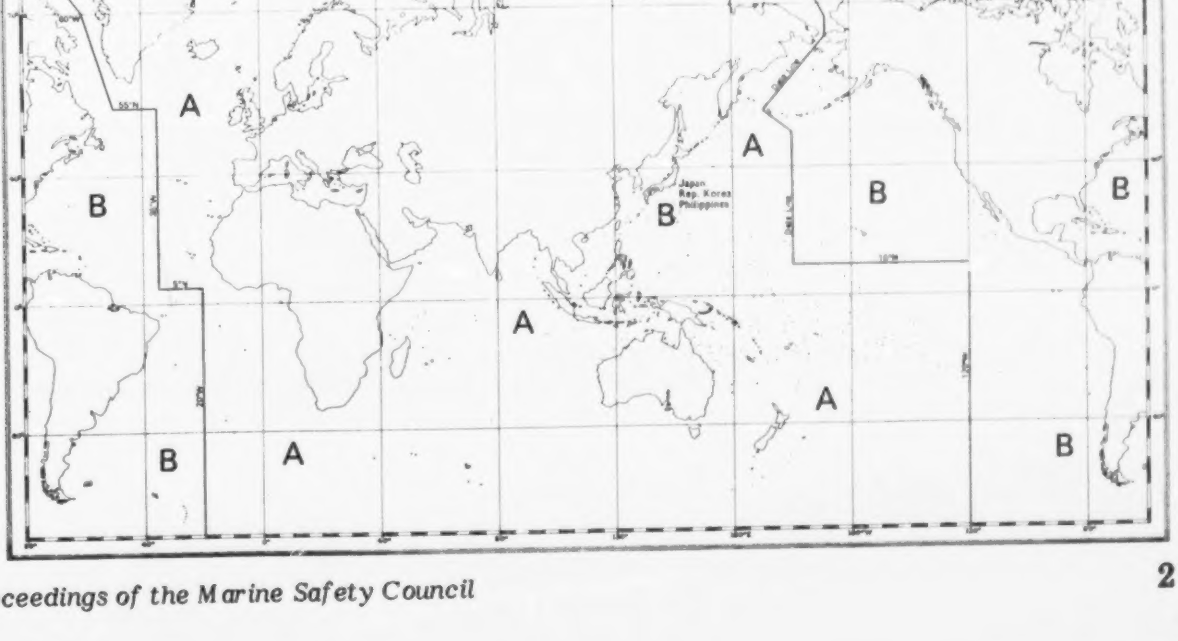
The Extent of the Changes

The majority of U.S. aids will not be affected, and conversion will be gradual. One Coast Guard officer suggested that the theme of the conversion program could be "If we didn't tell you we were changing, you probably wouldn't even notice." As stated earlier, the U.S. had already planned to make most of the changes now called for by the IALA system, and those changes will affect only about one-third of U.S. aids to navigation. Only about three percent of U.S. aids will require changes not otherwise planned or already permitted.

The changes will begin in 1983 in the waters shared with Canada. So that no additional funds will be required, the Coast Guard plans to convert its buoys over a six-year period as they

IALA MARITIME BUOYAGE SYSTEM

Buoyage Regions A and B, November 1980



Markings from the IALA Maritime Buoyage System to be incorporated into U.S. aids to navigation starting in 1983

Starboard-hand Lateral Aids:
Color: Red
Shape: Nun or lighted
Light (when fitted): Red
Rhythm: Any, other than Comp Gp Fl (2+1)
Changes: Lights - from white or red to red only

Port-hand Lateral Aids:
Color: Green
Shape: Can or lighted
Light (when fitted): Green
Rhythm: Any, other than Comp Gp Fl (2+1)
Changes: Color - From black to green
Lights - From white or green to green only

Preferred Channel to Starboard:
Color: Horizontally banded green over red over green
Shape: Can or lighted
Light (when fitted): Green
Rhythm: Comp Gp Fl (2+1)
Changes: Color - From black to green
Lights - From white or green to green only
Light rhythm - From I Qk Fl to Comp Gp Fl (2+1)

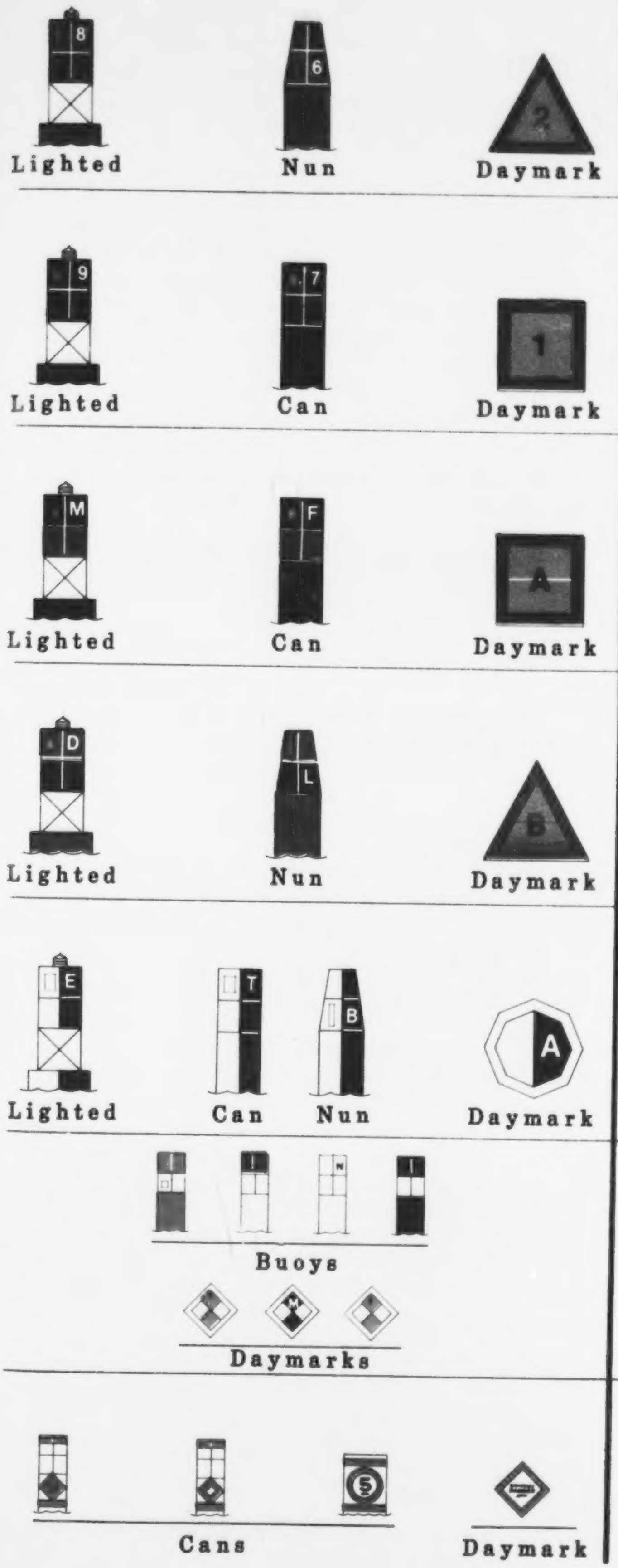
Preferred Channel to Port:
Color: Horizontally banded red over green over red
Shape: Nun or lighted
Light (when fitted): Red
Rhythm: Comp Gp Fl (2+1)
Changes: Color - From black to green
Lights - From white or red to red only
Light rhythm - From I Qk Fl to Comp Gp Fl (2+1)

Safe Water:
Color: Vertically striped red-and-white
Shape: Spherical or lighted (if lighted, red topmark)
Topmark (when required): Single red sphere
Light (when fitted): White
Rhythm: Morse "A"
Changes: Color - From black-and-white to red-and-white
Shape - Non-spherical buoys will have topmarks
Nun and can buoys will not be used

Special purpose:
Color: Yellow
Shape: Optional, but not conflicting with navigational marks
Light (when fitted): Yellow
Rhythm: Any, other than Qk Fl, Gp Qk Fl, Gp Qk & L Fl, V Qk Fl, Gp V Qk Fl, Gp V Qk Fl & L Fl, Gp Fl (2), Iso, Occ, L Fl, Mo (A), or Mo (U)
Changes: Color - From various color combinations to yellow
All special purpose-aids will be yellow and, when lighted, will use yellow lights.

Information and Regulatory Markers:

PRESENT SYSTEM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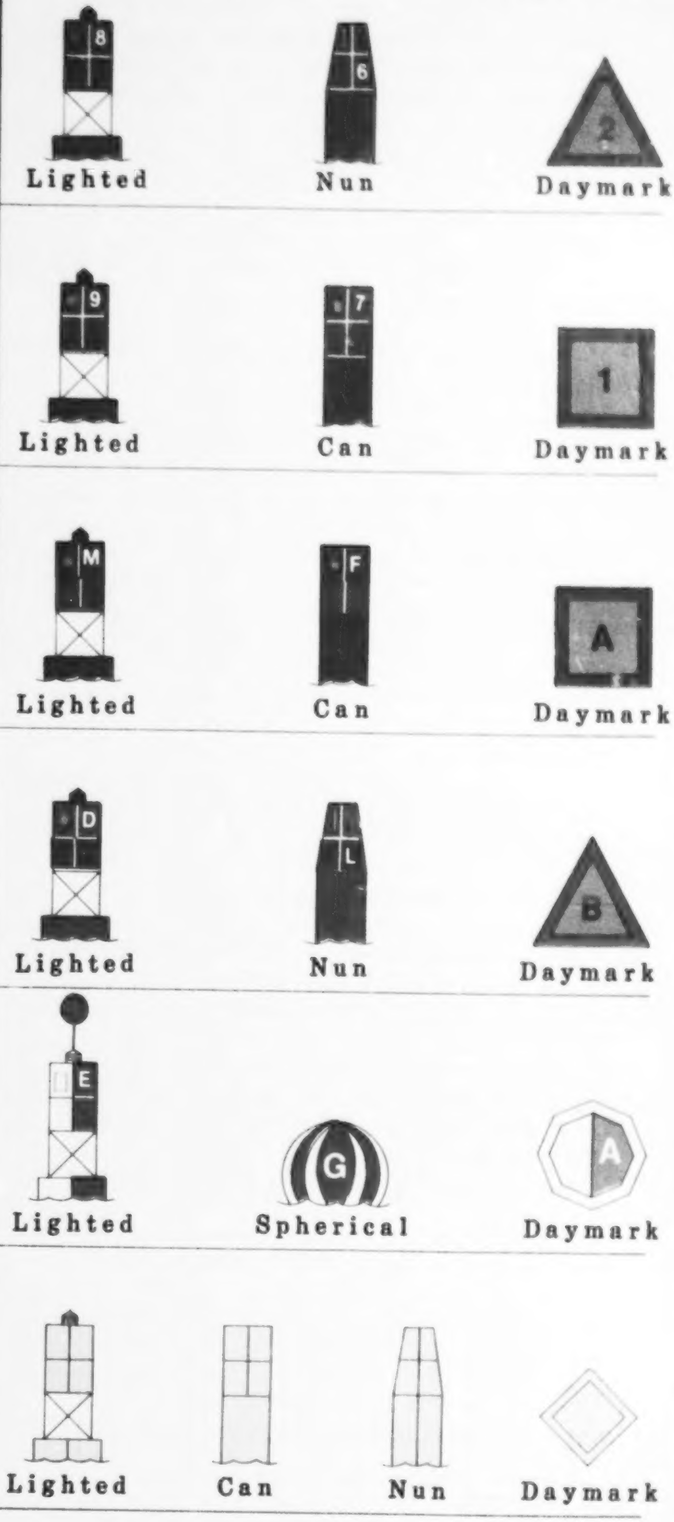
MODIFIED SYSTEM

TO BEGIN 1983 - TO BE COMPLETED BY 1989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NOTE: Information and Regulatory Markers will not be changed.

come up for their regularly scheduled overhaul and repainting. Lights will be changed as batteries expire. Solar panels are being installed by the Coast Guard on many aids to provide an inexpensive energy source. This addition will help reduce costs where lamp sizes must be increased to compensate for a color change.

The changes to be made are as follows *(see accompanying charts)*:

Lateral aids - The color red, the shapes, red and green light colors, and light rhythms will not change. The major changes under the new U.S. system will be making the port-hand buoys (numbering about 10,000) green and eliminating white lights on lateral aids.

"Junction" buoys - The U.S. has historically marked both junctions and bifurcations with horizontally-banded buoys called "junction" buoys. Under IALA, horizontally-banded buoys used to mark bifurcations are called "Preferred Channel" or "Modified Lateral Buoys." Aproximately 550 aids will be changed from banded black-and-red to banded green-and-red, and the light rhythm will become composite group flashing (2+1) rather than interrupted quick flashing.

Mid-channel and fairway aids - IALA calls aids used to mark mid-channels and fairways "Safe Water Marks." As described earlier, these buoys will change from vertically striped black-and-white to vertically striped red-and-white. Also, the unlighted/non-sound version (numbering about 80) will be replaced with spherical buoys, and the lighted/sound version will wear a topmark. The latter is the only buoy in the present U.S. system that will require a topmark. This feature should not cause much concern, as there are fewer than 275 in the entire system.

During the spring of 1982, the Coast Guard's Office of Navigation held public meetings on the East, West, and Gulf Coasts, as well as the Great Lakes, to assess public reaction to the planned changes in the U.S. buoyage systems. All segments of commercial and recreational maritime interests participated in these public forums. The reaction of the maritime community was largely favorable, and representatives of international shipping expressed strong support for the changes. It was the consensus of the many interested parties that conversion from black buoys to green should present no difficulties for the mariner.

The U.S. Maritime Marking System

	Approx. Number	%
Aids now complying	30,000	64
Starboard-side: white lights to be made red	2,000	5
Port side: black buoys and/or white lights to be made green	13,000	27
Mid-channel: unlighted to have spherical shape and black/white to be made red/white	350	1/2
I Qk Fl to be changed to Comp Gp Fl (2+1) on preferred channel	220	1/2
Non-lateral special purpose to be made yellow	1,500	3
		100%

Special purpose aids - The IALA agreement provides that these be colored yellow. There are approximately 1,500 aids which will need to be changed to yellow. These aids, when lighted, will display yellow lights.

For now, the Coast Guard does not plan to use topmarks on lateral or special aids. Further, it has no immediate plans to use cardinal marks and will use very few, if any, isolated danger buoys, and then not for several years. It believes isolated dangers can continue to be marked very effectively with lateral aids.

The changes do not affect lighthouses, sector lights, leading lights, lightships, LNBs, or information and regulatory markers. Crossing marks on the Western Rivers will not be changed and may continue to display white lights.

A color brochure showing the changes to be made has been prepared and will be available from Coast Guard District offices and the Coast Guard Auxiliary in the fall of 1982. Local Notices to Mariners will be issued as changes are carried out. The National Ocean Survey and the Defense Mapping Agency will place an explanation note on each chart issued during the six-year conversion period. The note will point out that green is the same as black on lateral buoys, red-and-white is the same as black-and-white on mid-channel buoys, etc.

Conversion to the IALA Maritime Buoyage System will be completed by 1989. ⚓

Plotting the Course of the Rules of the Road

Part II

by Charles F. Lehman

The following article has been adapted from "The Unruly History of the Rules of the Road," an article Mr. Lehman prepared for the December 1981 issue of the Proceedings *of the U.S. Naval Institute; copyright © 1981, U.S. Naval Institute.*

Last month, Part I of "Plotting the Course of the Rules of the Road" traced the history of the rules from the years of the first agreements to the start of the 20th century. At the conclusion of Part I, the U.S. was using four separate and distinct sets of rules: a set for international waters, a set for the Western Rivers, a set for the Great Lakes, and a set for the Inland Waters. In addition, there was a separate set of pilot rules for each of the three groups of internal waters. Possibilities for confusion were mounting, and the problems were compounded by the increasing sophistication of ships.

As new technology was spawned by the Industrial Revolution, many mariners began to question the way governing relationships between vessels were determined. The increasing speed and size of ships demanded a review of existing collision laws.

In 1929 an International Convention on Safety of Life at Sea was held in London. Changes to the International Regulations for Preventing Collisions at Sea were among the issues discussed, and a complete revision of the regulations was submitted to the membership. However, the world's maritime nations, including the U.S., failed to ratify the changes.

A second Convention on Safety of Life at Sea was called in London in 1948. This convention resulted in new International Rules which went into effect in 1951. The new rules addressed several navigation problems (navigating seaplanes on water, for example), formalized the orders to the helmsman (which had informally been agreed to by all maritime nations in 1935), and added a blind bend signal. Also, the so-called "danger" or "doubt" signal made its first appearance in international law, although use of the signal was not mandatory.

Nine years after these rules became effective, another international conference was called, resulting in some further minor changes. This 1960 Convention finally recognized radar as a collision avoidance tool and covered the use of it in an annex to the rules. Further, the new rules prohibited small vessels from hampering large vessels.

Interested persons in the United States had been discussing the need to unify this country's conflicting rules of the road for years. In his first edition of *Rules of the Nautical Road*, Commander Raymond F. Farwell described the system in effect at that time as a

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"hodgepodge" and voiced the opinion that one set of rules should be sufficient. The text, printed in 1941 and issued by the U.S. Naval Institute, was considered by mariners, admiralty lawyers, and the courts as a definitive work.

Soon after the start of the Second World War, the old Board of Supervisory Inspectors, which by then had been renamed the Bureau of Marine Inspection and Navigation, was transferred by Presidential Executive Order to the Coast Guard for the duration of the war. This action gave the Coast Guard the authority to issue and supervise statutory navigation laws and pilot rules. The Coast Guard's authority in this area was made permanent in 1946.

In mid-1946 the Coast Guard published a booklet entitled "Comparative Rules of the Road and How to Obey Them." It had numerous plates illustrating location and placement of lights on vessels for each of the different sets of U.S. rules and the international rules. Related illustrations for the respective sets of rules were grouped together to make differences and similarities readily apparent. The booklet also contained many commonsense slogans, such as:

- "You never have the right-of-way through another vessel."
- "No rule requires a privileged vessel to hold course and speed until collision is inevitable."
- "Being privileged is no privilege."
- "An overtaken vessel is not as fast but she got there first."
- "Good seamanship, like some other things, takes a lot of practice to get good at it."
- "The best place to know the rules and the worst place to study them is in a collision approach."

In the late 1950s, the Western Rivers Panel of the Coast Guard Marine Safety Council formally endorsed the concept of a unified set of rules and urged the Coast Guard to develop a new code. The Coast Guard published a second comparative analysis of the various statutes and pilot rules in 1959 as a discussion paper. This version included the various changes which had occurred since publication of the 1946 booklet.

Noteworthy modifications included the extensive changes made to the Western Rivers Rules in 1948. For example:

- Instead of applying to all rivers flowing into the Gulf of Mexico, the rules now applied only to the Mississippi and its tributaries above the Huey P. Long Bridge, the Warrior River System, the Atchafalaya River, and the Red River of the North.
- Rule 18 differentiated between meeting vessels according to whether they were ascending or descending a river, giving certain privileges to the descending vessel.
- Rule 19 gave the descending vessel with a tow the right-of-way over a steam vessel crossing the river.
- The rules added statutorily the danger, blind bend, and departing berth signals.

In 1953, the lines of jurisdiction were again changed to remove the Warrior-Tomigbee and the Mobile River from the Western Rivers Rules and place them under the Inland Rules.

Between the time of the drafting of the 1960 international convention and its going into effect in 1965, a concentrated effort was made to unify the three different internal statutes governing the Western Rivers, Great Lakes, and Inland Waters.

The Maritime Law Association in November 1964 adopted a resolution directing one of its subcommittees to meet and cooperate with the Coast Guard on the collision rules. The goal was to achieve the maximum uniformity possible between the International Rules and the United States' three sets of national rules.

The Coast Guard set up a Rules of the Road Coordinating Panel in 1965 under the chairmanship of Mr. Nicholas J. Healy, who was also President of the Maritime Law Association at that time. This panel developed a draft set of unified rules which was widely circulated.

Great Lakes mariners voiced concern over the proposed rules, which deviated from what they felt was a tailor-made set of rules to promote safety on the Great Lakes. Western Rivers operators, though consulted at every step, could not agree among themselves on the changes necessary to meet the special concerns which some of them perceived. Nonetheless, the members reaffirmed their support for unification at the October 1965 meeting of the Western Rivers Panel, which was held in Pittsburgh.

A second draft was circulated by the Coordinating Panel in 1966. This version encompassed the special provisions concerning the downbound vessel rule which Western Rivers pilots had always considered necessary. The new draft added additional range lights which Western Rivers vessels would have to show when underway, pushing ahead, or towing alongside. The proposal also made an exception for most special Great Lakes rules. By paying tribute to these standards, the proposal, in one sense, defeated the very purpose of unification.

During this period bills calling for rules similar to the unified code were introduced in Congress. Although many groups with marine interests were supportive of these bills, there was a great deal of dissatisfaction within some groups because of all the exceptions being made. There was still no unanimity among Western Rivers operators. Some were adamantly opposed to any change in the existing rules, while numerous others thought uniformity was an idea whose time had come.

No action was taken on the legislation, as it was deemed necessary to await completion of a revision of the International Regulations for Preventing Collisions at Sea (known as the COLREGS) being prepared by a subcommittee of the Inter-Governmental Maritime Consultative Organization (recently renamed the International Maritime Organization). IMCO recognized the technical changes taking place in ships and shipping and met to discuss recodifying the International Rules entirely, even though the latest version had been in effect only a few years. Since changes were occurring so rapidly, the domestic groups working on unification considered it wise to wait until the new set of International Regulations was developed. The draft changes being suggested by IMCO were a departure from the traditional format which had evolved over the years with only cosmetic changes.

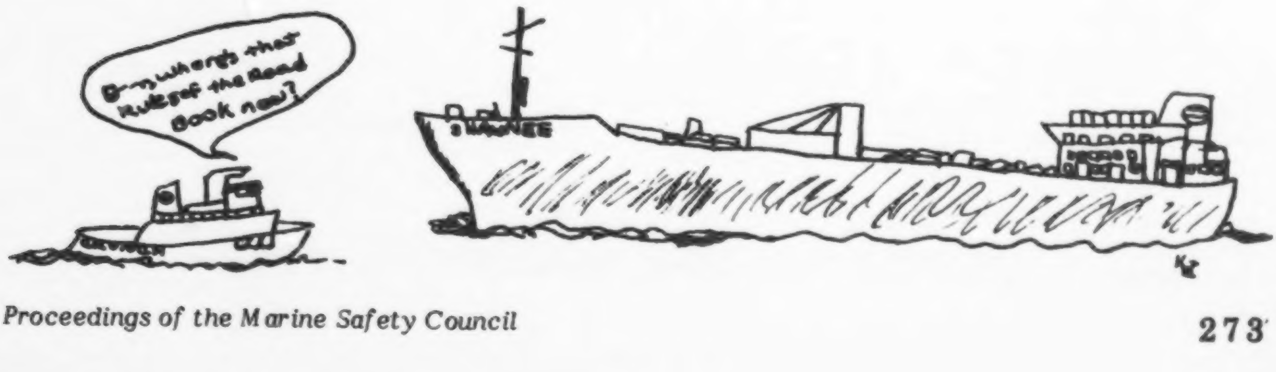
In October 1972, delegations from the world maritime nations convened in London and formulated what are now known as the 72 COLREGS. The convention setting forth the regulations went into full international force on July 15, 1977, after it had been ratified by the required number of nations representing a significant portion of the tonnage of the merchant vessels of the world fleets. Public Law 95-75, signed by the President on July 27, 1977, made the 72 COLREGS part of the U.S. statutory code.

The same year the 72 COLREGS became effective, the Secretary of Transportation formally established the Rules of the Road Advisory Committee (RORAC). Twenty members were appointed from geographically diverse areas of the country to represent all sectors of the maritime community. The committee's function was to provide advice and consultation to the Commandant of the Coast Guard on collision rules and regulations.

The unification of the United States rules was a main agenda item for the first meeting of this committee. It was also the main topic of discussion at all of the subsequent meetings.

The Chairman of RORAC from its inception was Mr. Gordon Paulsen, who for many years also chaired the Maritime Law Association's Navigation and Coast Guard Committee. Under his able direction, RORAC commenced the laborious task of drafting a set of unified domestic rules. RORAC was guided by two considerations. 1) The provisions of Rule 1(c) of the international regulations directed that nations with "special rules" ensure that their

"The best place to know the rules and the worst place to study them is in a collision approach."


D-n where's that Rules of the Road Book now?

navigational standards conform as closely as possible to the 72 COLREGS. 2) Even more important was the need to produce the safest possible code for the mariner who had to use and abide by the rules on U.S. internal waters.

During the debate over various passages in the drafts circulated to the members of RORAC, one member suggested that the following rule be considered:

> "When two or more vessels meet, no matter what the aspect, whether on rivers, harbors, roadsteads, bays, open oceans, or any body of water in which they can float, each shall immediately stop and wait for the other to pass."

Although this tongue-in-cheek command, if carried out, probably would have prevented all future collisions and eliminated the need for additional requirements, the Committee decided the needs of commerce and pleasure would be better served if a somewhat more detailed set of rules were promulgated.

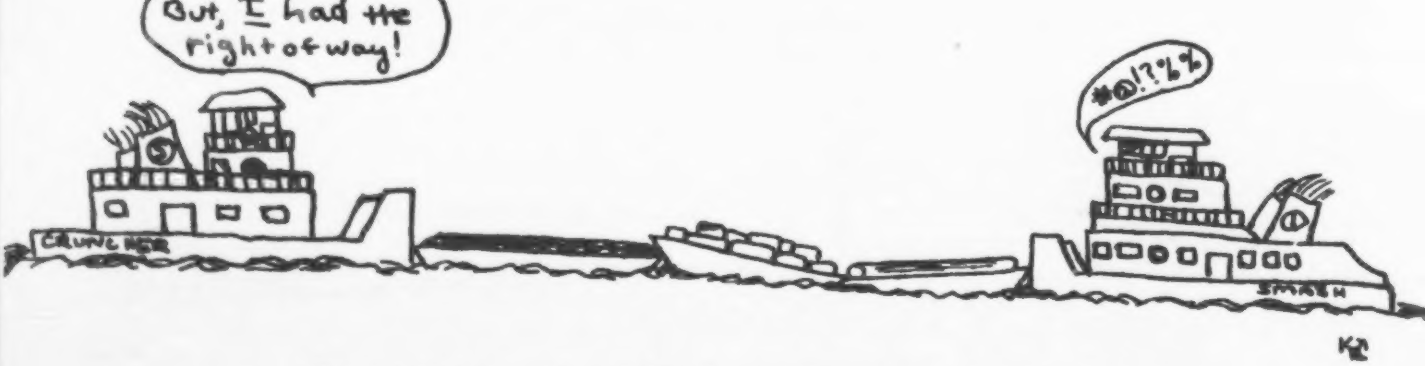
The efforts of the Committee ultimately resulted in a bill's being introduced in the House of Representatives during the 96th Congress. On June 12, 1980, Congressional hearings on "H.R. 6671" were held by Representative Mario Biaggi (D-NY). The bill, with minor modifications, was passed overwhelmingly by the House and sent to the Senate for consideration. The Senate Commerce Committee favorably reported the bill to the full Senate with only a few technical changes. Its report included most of the analysis of the provisions of the rules which had been submitted by RORAC. This interpretive report reflected the intent of Congress and will be of vital importance to future mariners who will use these rules.

On December 24, 1980, the President signed into law the Inland Navigational Rules Act (Public Law 96-591), set to go into effect one year later.

History has now come almost full circle. Our country's first general navigation laws, which applied to all vessels in all waters, diverged into one set of international rules and the three sets of regional rules which developed in response to different interests and ideas. The regional rules now have been replaced by a uniform set of national rules applying to all vessels navigating our domestic waters.

We also have an established mechanism to monitor the rules. RORAC (which Public Law 96-591 changed from the Rules of the Road Advisory Committee to the Rules of the Road Advisory Council) serves as an example that government and industry can work together to settle their differences and achieve common objectives. Were it not for this forum, vessels leaving port today might still be encountering as many as three sets of conflicting nautical standards en route to the open sea.

The purpose of navigation rules has remained constant since the days the first rules were codified: to prevent collisions and promote the safety of mariners. The rules themselves have not changed radically in substance but have evolved to meet the challenges presented by a rapidly developing and technologically changing world. When international or domestic navigation rules change in the future, as they are bound to do, the existence of agreed-upon, unified sets of rules will enable authorities to make the changes in a uniform and consistent fashion. ⚓


But, I had the right of way!
CRUNCHER
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SMASH
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"You never have the right of way through another vessel."

Too Many Fires in the Iron

by John F. McAnulty
Cargo Systems Branch
Marine Technical and
Hazardous Materials Division

Metal fires on ships are a phenomenon which is just beginning to be understood. Metal fires are different from other fires in that they burn at extremely high temperatures. They also present unique problems in firefighting. The three cargoes discussed in the following article (metal turnings, direct reduced iron, and zinc skimmings) have all been involved in metal fires. Awareness of the problems involved in carrying these cargoes and the special precautions which must be taken could serve to avert future fires.

Iron and steel products are usually made from either iron or steel scrap. In recent years, several commercial processes have been developed for production of an alternative to scrap known as "direct reduced iron," or "DRI." DRI, iron ore from which the oxygen has been removed, is essentially a type of "manufactured scrap," higher-quality scrap of known composition.

Because of the large investment necessary for manufacturing steel, the steel industry was once dominated by large enterprises such as U.S. Steel. Conventional plants consisted of blast furnaces, converters, open-hearth furnaces, etc. The increasing use of electric furnaces has led to a proliferation of small, low-capital plants using DRI or scrap as the chief ingredient. This is a trend which is likely to continue, and future steel production can be expected to take place in many small steel manufacturing facilities spread around the world. As more and more of these plants are opened, the manufacture and shipment by water of scrap and DRI will increase.

Metal Turnings

Most scrap presents no fire hazard in shipping, but that is not true of the lowest-price steel scrap. This scrap, called metal turnings, is a product of machine shop operations and consists of turnings, cast iron borings, and shavings. Metal turnings are often coated with oil (sometime combustible), have a high percentage of fine particles—approximately 40 percent—and thus a high surface-to-volume ratio (also a fire hazard), and may be contaminated with paper, wood, rags, and many other combustible materials. Since they have a tendency to ignite spontaneously, metal turnings are classified as

Loaded DRI pellets must be "trimmed," i.e., the peaks and valleys smoothed out, to guard against the "chimney effect."

hazardous when shipped in bulk (Part 148 of Title 46 of the Code of Federal Regulations). "Shipped in bulk" are key words here. This type of material is perfectly harmless if it is in a pile in the open air. Putting it in the hold of a ship, however, is another matter.

Freight costs are a significant factor in the price of scrap that is shipped. It is sometimes difficult to find a ship to carry metal turnings because of the hazard classification and their tendency to leave an oily film. Insurance underwriters charge a higher rate for metal turnings than for other grades of scrap because of the hazard classification.

The cost of shipping is further increased by Coast Guard regulations covering metal turnings. These regulations (1) limit the maximum temperature allowed in the hold and (2) impose count-down requirements (meaning that once a safe temperature level has been reached, the vessel is required to wait in port a certain period to make sure the temperature stays down). The Coast Guard will not release a shipment of turnings until these requirements are met.

Turnings are loaded onto a ship with magnets, buckets, or "skips" (in effect, large boxes with the top and front missing). In the first two cases, material is lifted from a pile or railroad car by cranes equipped with magnets or buckets. Skips are fed directly from a dump truck and are lifted by crane and tilted into the hold.

When loading has been completed, the metal turnings are smoothed out. This process is called "trimming" and is usually done with a bulldozer. Trimming the turnings prevents shifting at sea and compacts the material, which reduces the fire hazard by decreasing the amount of oxygen in the space between the particles. It also reduces what is called the "chimney effect." If there are peaks and valleys in a pile, air sinks in the valleys. The peaks, in turn, draw the flow of air upward. This produces a draft and turns an uneven pile into something akin to a fireplace. The chimney effect would not be so serious were it not for the "hot spot" problem in metal turnings. Temperature is so uneven in a pile of turnings that a probe every ten feet or so would yield many different readings. Because turnings are poor heat transmitters, heat does not escape. Hot spots may develop and reach temperatures

DRI pellets: a workman takes a sample as the finished product is fed to a storage pile.

of 200 or 300°F (95 - 149°C). These are the spots where fires will start, igniting spontaneously. They are the reason why the chimney effect must be minimized.

Metal turnings' tendency to heat up can be explained in terms of their high surface-to-volume ratio—their high percentage of fine particles. Finely divided metal of all types (aluminum, zirconium, iron in fine powdered form) is used in pyrotechnics. The principal ingredient in incendiary bombs, for example, is a mixture of aluminum and ferric oxide powder known as thermite.

Direct Reduced Iron

Man's attempts to convert iron ore to iron and ultimately steel date back to antiquity. For over 100 years, metallurgists have attempted to accomplish this conversion directly, without having to go the blast furnace route. The resulting product has been named "direct reduced iron." All of the commercial processes presently used to make DRI remove the oxygen by getting it to react with what are called "reducing gases," namely, carbon monoxide and hydrogen. What is left after the reaction is elemental iron, also known as metallic iron. The starting material for the process is usually powder, pellets, or lump ore. The particle size of the resulting iron is approximately the same as that of the starting material, but removing the oxygen reduces the weight by about one-third. When the oxygen is removed, the substance becomes very porous (DRI was initially referred to as "sponge iron"). Although an advantage weight-wise, this property gives the substance a high surface-to-volume ratio and increases the danger of fire.

DRI has certain characteristics which appeal to steel producers. As mentioned earlier, its composition is known. (Scrap, on the other hand, is a waste product, likely to be contaminated with other materials from the machine shop and often left unprotected and thus subject to such additions as cigarette butts.) Also, only those countries with large-scale steel industries (the United States, the Soviet Union, and England) create enough scrap to export it in large quantities.

The United States and Europe are not expected to be significant exporters of DRI products. Ultimately, the sources of DRI products will most likely be the same as the present sources of iron ore. It can therefore be predicted that the importation of DRI products into the coastal waters and inland waterways of the United States will increase greatly in the coming years.

The world's present DRI production capacity is about 25 million tons per year. About one million tons are produced for export each year. Many DRI production facilities are currently under construction, and the shipping rate is expected to increase to 5 million tons per year by 1985 and 20 million tons per year by 1990.

The Subcommittee for Containers and Cargoes of the International Maritime Organization (IMO) held its 23rd Session in London in February 1982. At that session, members drafted an amendment of the entry concerning shipment of DRI found in Appendix B of the Code of Safe Practices. Fifteen countries were represented in the working group for DRI. This amendment was adopted at the 46th Session of the Organization's Maritime Safety Committee, held in March 1982.

In brief, the amended entry establishes two types of DRI for shipping purposes. In the first category is DRI in the form of lumps, pellets, and cold-molded briquettes. The second category consists of hot-molded briquettes, a densified product molded at a temperature above 1,202°F (650°C). The lumps, pellets, and cold-molded briquettes are more hazardous than the

DRI pellets in a storage pile are covered to protect them from the elements.

hot-molded briquettes, since the densification process for hot-molded briquettes removes most of the oxygen.

Under the terms of the amendment, shippers must certify that the material conforms to the requirements of the Code of Safe Practices. They must monitor for the presence of oxygen and hydrogen during the voyage and must do one of the following: (a) maintain an inert atmosphere containing less than 5% oxygen, (b) treat the DRI with a corrosion-resistance process, or (c) meet the conditions for waiving the inerting requirements for short or sheltered voyages.

The hot-molded briquettes are not subject to the same restrictions as lumps and pellets. A competent person, however, must certify to the ship's master that the DRI is suitable for shipment. The hot briquettes may not be loaded if their temperature rises above 150°F (65°C), and the hold must be adequately ventilated to prevent hydrogen buildup. (A concentration of as little as 4% hydrogen in air will cause an explosive mixture.)

Spontaneous Heating

Rusting, or oxidation, is a problem with both metal turnings and DRI. Iron in its elemental state is unstable. Oxidation is its way of returning to the state in which it is usually found in nature.* Metal fires are simply oxidation that is taking place at a fast enough rate and high enough temperature to produce flames. The following is a recapitulation of some of the factors that may affect the oxidation process and its attendant hazards:

1. The presence of contaminants such as scraps of wood, paper, oil, automobile tires, rags, and other debris. Contaminants can be a very significant factor in starting and maintaining rapid oxidation. This is particularly true of metal turnings from shops where large quantities of cutting oil are applied during machining.

2. The surface-to-volume ratio. The higher the surface-to-volume ratio, the more vigorous the oxidation reactions. Although DRI does not have the high percentage of fine particles found in metal turnings, the problems with heating up are the same. As stated earlier, the removal of oxygen from the lumps or pellets makes them very porous and results in a high surface area per unit of volume.

3. Wetting the material. This, which can be the result of natural causes or a deliberate, if misguided, dust-controlling measure, greatly increases the reaction rate. In fact, if the material is kept dry at all times, the oxidation rate is extremely slow. The IMO Code for Bulk Solids recommends that, once wetted, DRI pellets, lumps, and cold briquettes not be shipped by water.

4. A rise in temperature. A rise in temperature, always a problem in a self-heating material, will greatly increase the rate of reaction. It is a rule of thumb in the world of chemistry that the rate of a chemical reaction doubles for every 10°C (18°F) rise in the material's temperature.

5. The ability of the material to transfer heat. DRI is as poor a heat conductor as metal turnings are. Therefore, when a hot spot develops in a material in the ship's hold, the heat cannot be transmitted to the surrounding atmosphere. It continues to slowly spread and heat up the material until combustion commences. The larger the total volume, the more likely this is to occur.

6. The "chimney effect". This phenomenon, described earlier, will promote air circulation in uneven conical piles at the top of the material in a hold and speed up oxidation.

Tests for Stability

There are a great number of stability tests which have been developed to determine the tendency of the various materials to oxidize rapidly. Unfortunately, all manufacturers promote their own test methods and will not agree on a universal test for all products. The Coast

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* An interesting sidelight is the the case of DRI which was removed from a ship and piled onto a dock in Spain. As it oxidized, it increased its weight by one-third (the reverse process of decreasing in weight as its oxygen is removed). The additional weight resulted in the pile's causing structural damage to the dock.

A technician uses a test apparatus to measure the reactivity, or tendency to heat up, of DRI hot-molded briquettes.

Guard continues to work with many manufacturers to find a universal test that would be acceptable to all of them. Such a test should be conducted to identify differences in characteristics relating to the passification (corrosion-resistance treatment) process used by a manufacturer.

Countermeasures

There are certain actions that, if taken, can reduce the possibility of spontaneous combustion in these materials:

(1) Selecting a material that is known to be relatively stable for shipment. For metal turnings this would mean materials free of or having only small quantities of metal borings and containing no screw machine turnings or heavily rusted turnings.

(2) If possible, removing all debris before loading.

(3) Passivating the product (treating it for corrosion resistance) during manufacture or prior to shipping. One method of accomplishing this is simply to expose the material to air and allow the oxide film to passivate the particles, although this is only partly effective. A number of novel methods of passification are now under study.

(4) Purging the hold with inert gas. This will displace the oxygen, and the hydrogen will be maintained below the explosive limit. Also, the lowered oxygen concentration will slow or eliminate oxidation. Candidate gases include nitrogen and carbon dioxide. The purging procedure requires sealing the hold and continuously injecting the makeup gas. The inert gas must work its way down into voided spaces in the cargo to be effective.

(5) In loading the ship, handling the material as little as possible. Each handling exposes more reactive surface.

(6) Monitoring the shipment before and after loading. This is usually accomplished by inserting temperature probes throughout the material. If high temperature readings are received, the ship cannot move until the readings correspond to Coast Guard regulatory requirements (Part 148 of Title 46 of the Code of Federal Regulations).

(7) Inserting plastic sheets at various depths in the cargo to prevent the air from the atmosphere from penetrating the pile or circulating through the pile.

(8) Digging out hot spots from the material in the hold.

(9) Inserting cool inert gas in the pile of material. Nitrogen, for example, which becomes a gas at -340°F (-210°C), can be used to counteract the heat of hot spots.

All the above methods reduce the likelihood of fire incidents. However, once the material actually breaks into flame there is little that can be done other than drowning it with water or unloading it at the most convenient location. If the first solution is tried, it should be remembered that wet metal is very heavy and that flooding the hold will make the ship unstable and may cause it to sink. The second solution may be impossible if permission to unload the cargo cannot be obtained. If the cargo can be unloaded, however, simply spreading the material over a large area will serve to put out the fire.

Known Incidents

The heating-up problem with metal turnings has been a source of concern for several years. The table below shows a list of the better-known incidents which have taken place. There have not been as many incidents with DRI, and there is thus not enough data to compile a table.

VESSEL AND FLAG	DATE OF FIRE
M/V AGIOS GIORGIS (Greek)	March 5, 1969
M/V SUAN-SAVAH (Libyan)	March 5, 1969
M/V KOIKU MARU-EUROWAVE (Greek)	July 16, 1969
M/V WORLD EXPLORER MEDCEMENT CARRIER (Greek)	August 8, 1969
M/V KRAS (Yugoslavian)	October 12, 1970
M/V PHOLEGANDROS (Greek)	November 4, 1970
M/V PONTOS (Belgian)	December 9, 1970
M/V PATERELIAS (Libyan)	January 6, 1971
M/V REINE DES ANGES (Belgian)	February 9, 1972
M/V AJAX (British)	May 31, 1972
M/V NORTRANS VISION (Norwegian)	April 11, 1973
M/V GEORGIAN GLORY (Greek)	May 2, 1973
M/V PAULINE (Libyan)	May 31, 1973
M/V MEGALOHARI II (Greek)	September 7, 1973
M/V NORTRANS VISION (Norwegian)	February 29, 1974
M/V GALICIA (Panamanian)	March 4, 1974
M/V BRUNLA (Norwegian)	July 1978
M/V ANGELIKI (Greek)	July 23, 1978
M/V MIHAL L (Singapore)	August 17, 1978
M/V BRUNTO (Norwegian)	August 9, 1979
M/V REGAL SUN (Greek)	September 26, 1979

Metal turnings from the M/V BRUNLA are removed from the hold and loaded onto the dock after catching on fire.

Zinc Skimmings

So far, we have been discussing metal fires associated with iron. Nonferrous metals are also hazardous, especially in powdered form. As stated earlier, such metal powders (zirconium, aluminum, and magnesium) are used along with iron to make pyrotechnics.

One product that has even a lower percentage of metal than zinc powder has been the cause of three fires and explosions in U.S. ports. This product is known variously as zinc skimmings, ashes, dross, or residue. The most notable incident occurred on January 21, 1982. On that date an explosion and subsequent fire occurred in hold No. 3 on board the ASIA GEM. At the time of the casualty, the vessel was bound for Yokohama, Japan, after departing from Long Beach, California. The explosion--so strong that it blew the sections of the hatch cover a considerable distance--resulted in the death of a crewman who was making the No. 3 hatch cover watertight by applying a kerosene flame to the hatch seal. The crewmen tried a variety of techniques to extinguish the fire, including the expensive extreme of injecting liquid nitrogen. The fire was extinguished after three days, but officials decided nevertheless to unload the cargo back at the dock in Long Beach. The Coast Guard conducted an official investigation and offered the following conclusions:

- The primary cause of the casualty was the ignition of hydrogen gas within the hold when the crewman approached the hold with the burning torch to apply heat to the sealing tape located on the hatch cover.
- The application of sea water at the loading dock (apparently to control dust) contributed to the casualty. The water caused the release of hydrogen.
- The fact that the captain and chief mate were not aware of the hazardous potential of the zinc contributed to the casualty.

Even though the above conclusions accounted for the reaction, they left unexplained the extremely rapid rate of hydrogen release noted. The material was analyzed and found to have a zinc content of 62%. Of this 62%, 31% consisted of zinc oxide and similar compounds and 31% consisted of elemental zinc. While zinc oxide is stable, the reaction between elemental zinc and water which has become acidic (sea water, for example) is a violent one.

In another incident, two LASH barges were in the process of loading onto a mother ship when one barge exploded. The second was found to be emitting a gas measuring more than 60% hydrogen at the vent. As noted earlier, any air having a concentration of hydrogen greater than 4% can explode if ignited. The barge just described was literally a bomb, waiting to go off.

Metal turnings, direct reduced iron, and zinc skimmings ("ashes") are all entries in Appendix B to the IMO Code for Safe Practices for Solid Bulk Cargoes. The zinc ashes entry will be reviewed at the 24th Session of the Subcommittee for Containers and Cargoes in London next year. The entries for DRI and metal turnings were agreed to at the 23rd Session this year. The National Academy of Sciences will be issuing its "Report on Metal Fires" in the near future, and the Coast Guard and IMO may alter their regulations and Code on the basis of NAS' findings. As the Coast Guard gains experience with and increases its knowledge of metal fires, it will refine its own regulations for the Carriage of Solid Hazardous Materials in Bulk.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. The side lights on a vessel shall be constructed to show a light from ahead to

A. the beam.
B. aft.
C. two points forward of the beam.
D. two points aft of the beam.

REFERENCE: CG-169, Rule 21(b)

2. Having the handle of an all-purpose nozzle in the forward position will

A. produce high-velocity fog.
B. produce low-velocity fog.
C. produce a straight stream.
D. shut off the water.

REFERENCE: CG-329, Sec. 3-1-12

3. Galvanizing would not be suitable for protecting wire rope which is used for

A. shrouds.
B. cargo runners.
C. stays.
D. mooring wires.

REFERENCE: Navy Seaman's Manual

4. What is the meaning of a chart scale of 1:80,000?

A. One inch on the chart equals 80,000 inches on the surface of the earth.
B. It would always be considered a large-scale chart.
C. In the U.S., the chart would be used only as a harbor chart to give the greatest possible detail.
D. One inch on the chart equals approximately 80 miles on the surface of the earth.

REFERENCE: Duttons

5. Which is NOT defined as a finely divided organic material?

A. Charcoal
B. Peat moss
C. Aluminum powder
D. Sugar

REFERENCE: 46 CFR 146.03-12

ENGINEER

1. An electrical component is connected across a 120-volt, 60-hertz AC supply. What is the current drawn by the component if the impedance is 200 ohms?

A. .01 amperes
B. .6 amperes
C. 1.67 amperes
D. 100 amperes

REFERENCE: Basic Electricity

2. Violent gassing from a lead-acid battery while it is being charged indicates that the

A. plate separators are grounded.
B. battery compartment ventilation is inadequate.
C. electrolyte specific gravity is too low.
D. charging rate is too high.

REFERENCE: Hubert

3. When the operating handle of a molded-case circuit breaker is in mid-position, it indicates that the circuit breaker is

A. on.
B. off.
C. reset.
D. tripped.

REFERENCE: Hubert

4. Which statement is true concerning anti-friction bearings installed on pumps?

A. The inner race should be free to turn on the shaft.
B. The outer race should be free to turn in its housing.
C. Alignment is not a critical factor in their installation.
D. They are usually pressed onto their shafts.

REFERENCE: Karassick

5. When a tubular bowl centrifuge is used for purifying fuel oil, which factor determines the size of the ring dam to be used?

A. The viscosity of the fuel
B. The quantity of water to be removed from the fuel
C. The specific gravity of the fuel
D. The quantity of dirt to be removed from the fuel

REFERENCE: NAVPERS Engineman 3 & 2

ANSWERS

DECK
1.D;2.D;3.B;4.A;5.C
ENGINEER
1.B;2.D;3.D;4.D;5.C

LOOK
WHERE YOU'RE GOING!
Doc

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New R&D Report Summarizes "Springing" Research

Over the past 10 years, the typical design length of Great Lakes ore carrier vessels has almost doubled. Because of the limitations of the locks through which these vessels operate, the draft and beam of the vessels (which for open waters would have been designed to be larger) have had to remain small relative to the vessel length. This trend has resulted in vessels whose length to draft ratio (L/D) is as high as 20 to 22. The highest L/D ratio covered by the "Great Lakes Load Line Regulations," a design safety guide for ships to be used on the Great Lakes, was previously established as 19. These high L/D structures have been found to be susceptible to a vertical vibration known as "springing."

Since 1972, the Coast Guard Office of Research and Development has sponsored research on the springing phenomenon on a 1,000-foot, high-L/D ore carrier, the M/V STEWART J. CORT. A series of reports has been published from this research. The latest of these reports is a summary of research done on the M/V CORT up to 1980. The main text includes a complete description of springing, pertinent characteristics of the M/V CORT, past Coast Guard springing research efforts, and the methods used to conduct this research.

This information should be of particular interest to naval architects and others involved in ship design. The results will aid in improving the construction standards for future Great Lakes ore carriers.

Copies of the report, "Springing Research of a Great Lakes Ore Carrier," can be obtained from the National Technical Information Service (NTIS), Springfield, Virginia 22161, by specifying Report No. CG-D-13-82, Accession No. AD-A115-466. Springing research done during 1981 is not included. A separate report on that subject will be published shortly. ⚓

M/V STEWART J. CORT

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of the Marine Safety Council

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Proceedings
of the Marine Safety Council

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Admiral James S. Gracey, USCG
Commandant

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Captain Christopher M. Holland
Executive Secretary

Julie Strickler
Editor

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cover

Tanker casualties threaten not only the safety of the crew, ship, and cargo, but also the environment (the beach in the photograph is part of a stretch of 11 oil-coated miles on the coast of Puerto Rico). Beginning on page 293 is a three-article sequence on tanker safety. Roger A. Peterson examines the conditions under which casualties occur, Captain J. V. Caffrey talks about what his company, Mobil, does to promote safety, and Robert J. Lakey discusses the safety record of LNG ships.

A Letter from the Editor

Reader C. E. Hatton of Bailey Controls Company, King of Prussia, Pennsylvania, raised an interesting point in regard to DECK question No. 4 of the Nautical Queries in the August issue (in which "combustible" was defined according to the temperature at which an oil would give off "inflammable vapors"). Is not "flammable" accepted usage? asked Mr. Hatton.

I agree with Mr. Hatton that since most "in" combinations (complete/incomplete, sane/insane) are pairs of opposites, whoever decided that "flammable" and "inflammable" should be synonymous was inviting confusion. Perhaps safety would be better served if we dropped the word "inflammable" from the English language.

Since the Nautical Queries are examples of questions included in licensing examinations, however, I felt I would be doing the readers a disservice by arbitrarily changing the wording. I checked with the Coast Guard Institute in Oklahoma City, which prepares the questions, and was told that the Institute uses the words interchangeably but is probably more apt to use the word "inflammable."

I conducted a brief, informal poll and found that about half of the people I asked were under the impression that "inflammable" meant that something would not burn. This is a mistake that could have serious consequences. Getting questions on an exam right will do the mariner no good if he later incinerates himself. A pointer or two to people working with hazardous cargoes might be in order.

(The Coast Guard, by the way, uses "nonflammable" as the opposite of "flammable" in its regulations.)

Julie Strickler

Julie Strickler
Editor

If any of you have had occasion to study our masthead lately (inside front cover), you may have noticed that the Marine Safety Council has a new Executive Secretary. Since August, this position has been held by Captain Christopher M. Holland.

While the Marine Safety Council itself is made up of the admirals heading the various offices concerned with regulations (Chief Counsel RADM Edwin A. Daniels is presently serving as Chairman), the Council also has an independent staff. It is this staff, which arranges the monthly meetings of the Council and sees to its ongoing work between meetings, that the Executive Secretary heads. The Executive Secretary also serves as Regulations Officer for the Coast Guard, ensuring that all Coast Guard-issued regulations comply with the requirements of the legislative and executive branches of the government.

Captain Holland, a native of Belmont, Massachusetts, is a graduate of the U.S. Coast Guard Academy in New London, Connecticut, where he earned his B.S. in 1958. He also holds a law degree from the George Washington University Law School in Washington, DC. Before assuming the post of Executive Secretary, he served as Chief of the Legislative Division in the Office of Chief Counsel and as an appellate judge on the U.S. Coast Guard Court of Military Review. In the course of his career, he has also served as Commanding Officer of the Coast Guard cutters CAPE UPRIGHT and ARIADNE, as an instructor in antisubmarine warfare at the U.S. Navy Fleet Sonar School in Key West, Florida, as assistant administrative officer and legal officer at the Coast Guard's recruit training center in Cape May, New Jersey, and as District Legal Officer for the Fifth and Fourteenth Coast Guard Districts.

Captain Holland lives with his wife (the former Julia A. Koontz) and two children, Christopher and Michael, in Vienna, Virginia.

Maritime Safety Bill Introduced in Congress

On August 19, 1982, Rep. Walter B. Jones (D-North Carolina) introduced H.R. 7038, a bill "to promote maritime safety on the high seas and navigable waters of the United States."

This bill would require that, not less than 60 days before a current certificate of inspection expires, the owner, agent of the owner, or operator of a vessel for which Coast Guard inspection is required submit to the Commandant either a request for reinspection or a notice that the vessel will no longer be engaged or operating. Penalties for knowingly operating such a vessel without a valid certificate would range up to $50,000 a day.

The bill also covers vessel owner reporting requirements. Owners, operators, or agents of the owner would be required to notify the Coast Guard when they had reason to believe a vessel had been lost or imperiled. The Coast Guard would also have to be notified of a lack of communication for more than 48 hours from a vessel required to report to the U.S. Flag Merchant Vessel Location Filing System.

Nominations Open for Shepheard Maritime Safety Award

Nominations are being accepted for the 1982 Rear Admiral Halert C. Shepheard Award for Achievement in Merchant Marine Safety.

The award is given either for a single outstanding contribution to merchant marine safety or for dedication to and constructive participation in activities associated with maritime safety over a period of time. Nominees may include individuals such as ship operators, naval architects, marine engineers, ship repairers, and shipbuilders or those associated with ship operations, government, or marine associations.

The award was established by the American Institute of Merchant Shipping (AIMS) in 1976 in honor of the late Admiral Shepheard, who served in the United States Coast Guard as Chief of the Office of Merchant Marine Safety and who was internationally acclaimed for his work in this field. The award is administered by the American Bureau of Shipping (ABS).

Nomination forms may be obtained by writing to the following address: Rear Admiral Halert C. Shepheard Award, c/o Thomas J. Tucker, Committee Secretary, American Bureau of Shipping, 65 Broadway, New York, New York 10006. The deadline for receiving nominations is January 3, 1983. The award will be presented on April 19, 1983, at the ABS annual meeting at ABS headquarters in New York City.

Retired Admiral Honored by IMO

The International Maritime Organization has awarded RADM Roderick Y. Edwards, USCG (Ret.), its International Maritime Prize in recognition of his significant contribution to the work and objectives of IMO. This is the second awarding of the prize, which was established in 1978, and it is the first time it has been awarded to a U.S. citizen.

RADM Edwards began his active participation in the work of IMO in the organization's earliest years. He provided leadership during the time IMO, formerly the Inter-Governmental Maritime Consultative Organization, was easing the way for cooperation among governments and fostering the development of high standards of maritime safety and pollution prevention.

While representing the U.S. on numerous IMO bodies, RADM Edwards served as vice chairman of the Subcommittee on Marine Pollution, president of the 1974 Safety of Life at Sea Conference and chairman of its steering committee, chairman of the council (four terms), and president of the 11th Assembly.

MarAd Publishes Stowage Guide

A Shipper's Guide to Stowage of Cargo in Marine Containers, a publication of the Maritime Administration, is now available from the U.S. Government Printing Office.

This publication is directed at shippers, loading dock personnel, and others directly involved with the loading of ocean containers. The guidelines provided are aimed at both safety and efficiency. The guide describes the consequences of improper stowage and explains how to avoid them by using the proper size and type of container and properly inspecting and loading it. Also included are stowing and securing guidelines for the eight basic cargo types.

Copies of the guide are available for $4.75 from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The order number is 050-015-00004-1.

Report on Collision Avoidance Released

The Maritime Administration has released a report on advanced technology for investigating open-sea, multiple-ship encounters. This type of investigation was developed to provide a better explanation of such collisions than conventional means do and to serve as a quantitative basis for generating necessary avoidance maneuvers. The study, "Multiple-Ship Collision Avoidance Analysis in the Open Seas—Phase III," was prepared for MarAd by Systems Control Technology, Palo Alto, California.

The company's approach was to develop a baseline multi-ship collision-avoidance algorithm for use in a computer-based evaluation system. By using this algorithm, operators can evaluate collisions involving as many as six ships. The original closest point of approach (CPA) and time to closest point of approach (TCPA) are identified for each pair of ships, and calculations following changes in ship course and speed are updated based on algorithm recommendations.

A number of sensitivity studies on collision-avoidance factors were done using the evaluation system. Included were rules of the road validity, sensor error effects, maneuver effectiveness, encounter-scenario factors, ship-to-ship communications benefits, and procedural factors. The results of these tests are being provided to the U.S. merchant fleet.

Copies of the report are available through the National Technical Information Service (NTIS), Springfield, Virginia 22161, as follows:

Volume I - Executive Summary - PB 82-207671 - $6.

Volume II - Technical Report - PB 82-207689 - $24.

NFPA Updates Fire Codes

An update to the *1982 National Fire Codes* is now available from the National Fire Protection Association (NFPA). This two-volume set, the *1982 National Fire Codes Supplements*, covers all Codes and Standards approved or revised at the NFPA annual meeting in May 1982. These include NFPA 1 - Fire Prevention Code, NFPA 15 - Water Spray Fixed Systems, and NFPA 72E - Automatic Fire Detectors. The catalog number for the supplements is NFC-S82, and the cost of the set is $40.

Published annually, the National Fire Codes are a product of NFPA's standard-making process. The development of these advisory codes and standards is the responsibility of some 160 technical committees representing various interests affected by the standards.

The *1982 National Fire Codes* features the full texts of all 230 NFPA Codes, Standards, Recommended Practices, Manuals, and Guides and 49 Codes and Standards which were approved or revised by NFPA technical committees during 1981. These include NFPA 56B - Respiratory Therapy, NFPA 256 - Methods of Fire Test of Roof Coverings, NFPA 655 - Prevention of Sulfur Fires and Explosions, and NFPA 1202 - Organization of a Fire Department. The catalogue number for the codes is NFC-Set, and the set costs $150.

For more information on the *1982 National Fire Codes* and the *1982 National Fire Codes Supplements*, contact the National Fire Protection Association, Publications Sales Division, Batterymarch Park, Quincy, Massachusetts 02269; (617) 328-9290.

West Coast residents can order directly from Global Engineering Documentation Services, Inc., 3001 W. MacArthur Boulevard, Santa Ana, California 92704.

The National Fire Codes are also available on microfilm from Information Handling Services, Denver Technological Center, P.O. Box 1154, Englewood, Colorado 80110, or from Showcase Corporation, 1200 Quince Orchard Boulevard, Gaithersburg, Maryland 20760.

Report on Shiphandling Course Available

In March 1981 the Coast Guard sponsored a demonstration course in shiphandling in rough weather. Senior Deck Officers from major U.S. shipping firms and maritime education institutions took part in the course, which was held at the Merchant Marine Academy in Kings Point, New York.

The course in New York was patterned after a similar course developed in Norway.

The Coast Guard has been a co-sponsor of a Norwegian project known as "SO3," which is managed by Det norske Veritas and is aimed at improving the safety of the crew, ship, cargo, and environment in rough weather. Ship motion- and load-monitoring and guidance equipment has been found to provide useful information in such weather, but mariners need to be taught how to use the equipment. The shiphandling course was developed in response to that need.

Among the topics covered during the two-day course in New York were regular and irregular waves; the influence of changes in course, speed, and load condition on seakeeping performance; and the principle of monitoring vessel responses with operation-oriented instruments. Each general session was followed by a problem and solution period.

The report on the course includes an explanation of its background, an abstract of the course content, a summary of the lecture notes, the results of a course evaluation by participants, and a Det norske Veritas guide on rough weather shiphandling. It can be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. Report No. CG-M-7-81, AD A115176 should be specified.

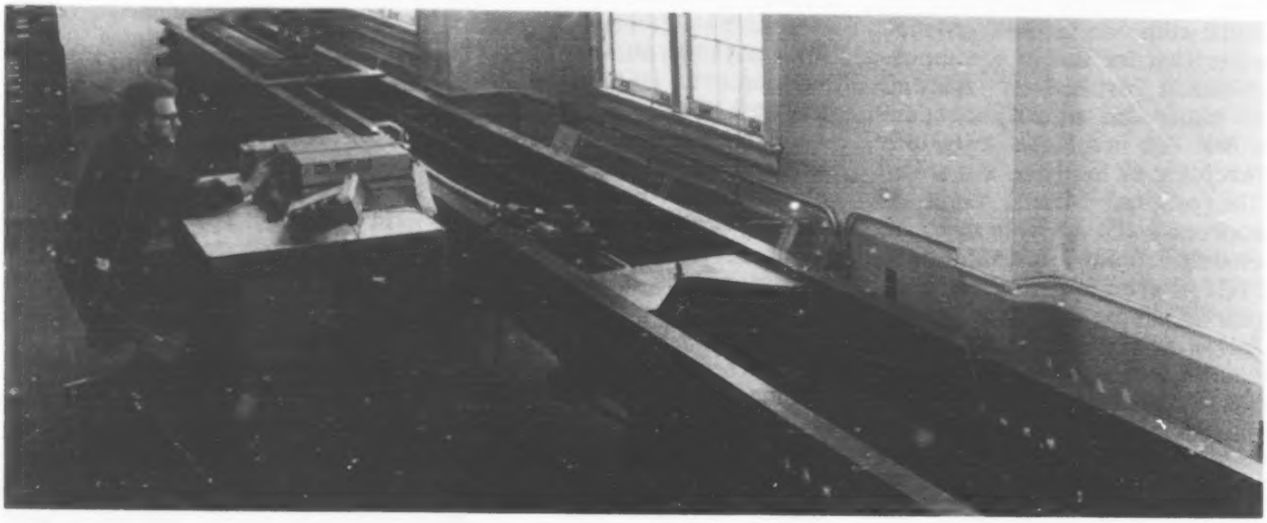
R&D's Rope Lab Evaluates a Rope Safety Problem

Synthetic rope is used extensively for the lines used to moor and tow ships. These lines may be subjected to great tensions (during a ship's maneuvers in approaching a pier or in high wind conditions, for instance). When the tension exceeds a breaking point, a potentially hazardous phenomenon known as "snapback" occurs. Snapback is the recoil of the broken line toward and past the point(s) at which it is secured. This can pose a threat to personnel in the vicinity.

The Coast Research and Development Center has recently developed a technique for evaluating synthetic line samples to determine their potential for snapback. Several types of line were stretched until they snapped using the Center's rope-testing machine. High-speed photographs of the event provided information on the energy released when the rope snapped, the speed of the recoiling line, and the path the line followed.

In addition to establishing a testing technique for evaluating existing or proposed synthetic line materials and construction methods, the researchers made a number of other important findings. They found that lines snap back directly toward a fixed end if breakage occurs in a clear, straight segment of the line. If breakage occurs around a curved surface (such as a bollard), the recoiling line sweeps sideways as well, endangering a wide area.

A final report of this project, entitled "A Snapback Evaluation Technique for Synthetic Line," can be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. Report No. CG-D-29-82 should be specified. ⚓



Technician at Coast Guard R&D Center monitors the Center's rope-testing machine.

Keynotes

The following items of interest were published in the FEDERAL REGISTER between August 19, 1982, and September 16, 1982:

Final rules: CGD 09-82-24 LSCORA Southshore Classic, Detroit River, Special Local Regulation, August 19, 1982. CGD 05-81-08R Drawbridge Operation Regulations; Atlantic Intracoastal Waterway, Wrightsville Beach, North Carolina, August 19, 1982. CGD 12-82-01 Drawbridge Operation Regulations; San Joaquin River, California, August 19, 1982. CGD 07-82-11 Drawbridge Operation Regulations; Moser Channel, Monroe County, Florida, revocation, August 19, 1982. CGD 07-82-03 Drawbridge Operation Regulations; Atlantic Intracoastal Waterway, North Palm Beach County, Florida, August 19, 1982. CGD 82-043 Correction of Especially Hazardous Conditions Aboard Boats; editorial change, August 23, 1982. CGD 82-006 Issuance of Bridge Permits, Changes in Procedure, August 23, 1982. CGD 13-82-10 Tacoma Regatta, Washington State, August 26, 1982. CGD 09-82-06 Anchorage Area, Lake Betsie, Frankfurt, Michigan, August 30, 1982. CGD 09-82-02 Anchorage Area, Little Traverse Bay, Lake Michigan, Harbor Springs, Michigan, August 30, 1982. CGD 02-81-04 Drawbridge Operation Regulations; Illinois Waterway, Joliet, Illinois, August 30, 1982. CGD 07-82-05 Drawbridge Operation Regulations; Hillsboro River, Atlantic Intracoastal Waterway Mile 1050, Florida, August 30, 1982. CGD 07-82-08 Drawbridge Operation Regulations, Sarasota Pass, Gulf Intracoastal Waterway, Florida, August 30, 1982. CGD 07-82-12 Drawbridge Operation Regulations, St. Lucie River, Florida, August 30, 1982. CGD 80-001 Unmanned Barges Carrying Certain Dangerous Bulk Cargoes, correction, September 2, 1982. CGD 76-170 Casualty Reporting Requirements, September 9, 1982. CGD 11-79-02 Establishment of Safety Zones Around Structures on the Outer Continental Shelf (OCS) and Navigable Waters of the U.S., September 9, 1982.

Notices of proposed rulemaking (NPRMs): CGD 11-82-01 Anchorage Grounds, Los Angeles/Long Beach Harbor, August 30, 1982. CGD 03-82-017 Drawbridge Operation Regulations; Harlem River, New York, August 30, 1982.

Notices: CGD 82-083 Withdrawal of Notice of Intent to Prepare an Environmental Impact Statement, Proposed Bridge over the Columbia River, August 19, 1982. CGD 82-082 Notice of OMEGA Station Australia Operational Declaration, August 26, 1982. CGD 82-066 Small Vessel Towing and Salvage Policy Study, Notice of Public Meetings, August 30, 1982. CGD 82-088 Houston/Galveston Navigational Safety Advisory Committee; Notice of Establishment, September 2, 1982. CGD 82-089 Towing Safety Advisory Committee; Notice of Meeting, September 2, 1982. CGD 81-058 Boundary Lines, Extension of Comment Period, September 16, 1982. CGD 82-090 Ship Structure Committee; Notice of Meeting, September 16, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; tel.: (202) 426-1477.

* * *

Radar Observer Endorsement—Demonstration of Skills (CGD 76-193(a))

The Coast Guard published a final rule in the September 16, 1982, edition of the FEDERAL REGISTER amending the testing procedures for a radar observer's endorsement on merchant marine deck officer licenses. Rather than simply gauging ability on the basis of a written examination, the Coast Guard will now require applicants for a radar endorsement to demonstrate their skills.

For further information, contact CDR Scott D. McCowen, U.S. Coast Guard (G-MVP-5/14), Washington, DC 20593; tel.: (202) 426-2251.

Aluminum Hatch Covers Proposal Withdrawn (CGD 78-121)

All newly constructed tankships are required by the Coast Guard to have hatchcovers made of steel (or an equivalent material). This requirement resulted from a National Transportation Safety Board (NTSB) recommendation made after an investigation of a collision between a gasoline-laden tankship and another vessel in 1974. In the accident, the heat of the fire caused the aluminum hatch covers to melt, permitting the fire to spread from tank to tank. On October 21, 1980, the Coast Guard published a proposal that would have required the retrofitting of existing tankships with steel hatch covers. Further economic analysis revealed that this action would not be cost-effective. A notice of withdrawal was published in the FEDERAL REGISTER on September 2, 1982.

For further information, contact Don Kerlin, U.S. Coast Guard (G-MTH-4/12), Washington, DC; tel.: (202) 426-2197.

Requirements for Painters with Float-free Links (CGD 79-167)

On September 16, 1982, the Coast Guard published a final rule that will require life floats and buoyant apparatus on tank vessels, passenger vessels, cargo and miscellaneous vessels, small passenger vessels, and oceanographic vessels to be secured by means of a painter and a float-free link. This will prevent the life floats and buoyant apparatus from drifting away from a sinking vessel. The regulation will also require that each new float be equipped with reflective material to increase its visibility at night.

For further information, contact Robert Markle, U.S. Coast Guard (G-MVI-3/12), Washington, DC 20593; tel.: (202) 426-1444.

Proposal on Visibility from Bridge Withdrawn (CGD 80-134)

The Coast Guard has withdrawn a proposal dealing with the problems of visibility from the navigation bridge. On May 11, 1981, the Coast Guard published an advance notice of proposed rulemaking soliciting comments and suggestions on this matter from the public. The majority of those responding agreed that a problem with visibility did exist but recommended that the Coast Guard work within the International Maritime Organization before issuing regulations. The Coast Guard agrees with this recommendation and, as this issue was going to press, planned to present IMO with a U.S. proposal on visibility from the navigation bridge in October. A notice terminating the rulemaking project was published in the FEDERAL REGISTER on September 2, 1982.

For further information, contact LCDR Robert W. Henry or CDR James A. Sanial, U.S. Coast Guard (G-MTH-4/13), Washington, DC 20593; tel.: (202) 426-2197.

MarAd Consolidates Citizenship Declaration Forms

On August 30, 1982, the Maritime Administration published a final rule in the FEDERAL REGISTER consolidating nine existing forms into one. These are the Documentation, Transfer or Charter of Vessels Consolidation of Citizenship Declaration Forms required under Part 221 of Title 46 of the Code of Federal Regulations.

The new single form (Form 899) "prescribes the declaration of the United States citizenship by a vendee, mortgagee or other transferee of a vessel" owned and documented under American law, as required by section 40 of the Shipping Act of 1916.

Actions of the Marine Safety Council

The Marine Safety Council had one item to consider at its September meeting. That project was:

CGD 82-084 Use of Strobe Lights as Visual Distress Signals

Strobe lights are commonly used as a distress signal in the inland waters of the U.S. Many private boaters believe that strobe lights are safer than flares. They have joined the National Boating Safety Advisory Committee in urging the Coast Guard to allow strobes to meet the requirements for carriage of emergency signaling equipment.

Although the Inland Navigation Rules recognize strobe lights as an emergency signal, the Coast Guard has been reluctant to approve them because they are not recognized as distress signals internationally. The reason for this is that the lights have other uses, such as marking buoys and offshore structures. A mariner seeing a strobe in international waters would probably avoid it rather than investigating it as a possible distress situation.

Accepting the arguments of private boaters and the National Boating Safety Advisory Committee, the Coast Guard proposes in CGD 82-084 that Part 135 of Title 33 of the Code of Federal Regulations (which governs required emergency equipment) be amended to include strobe lights as a recognized emergency signaling device. Their use would be recognized on waters subject to the Inland Rules and the U.S. waters of the Great Lakes. ⚓

Ferreting Out the Facts Behind Tanker Casualties

by Roger A. Peterson

In a memorandum on maritime safety dated May 15, 1981, the Nautical Institute of the United Kingdom called attention to

> "... an unnecessary and excessive loss of life at sea, loss of ships and cargoes, and an increasing potential danger to the marine environment. The effect of the rising level of gross tonnage lost resulting in higher costs of goods and services places an unacceptably high financial burden on the public."

The situation regarding maritime oil tankers is no better. Between 1964 and 1977, 220 vessels of 6,000 deadweight tons or above had to be written off as total losses, and 1,115 persons lost their lives. Environmental damage can only be guessed at, but 1,777,000 tons of oil spilled into the ocean as a result of the casualties.

A study of these casualties reveals certain recurring factors and points to a number of possible preventive measures.

Findings

First and foremost, of all the factors relating to the frequency of oil tanker accidents, I found none to be more critical than the attitude and nature of management. It is management which ultimately controls vessels and their operations, and if any one factor can be considered of primary concern, it is this one. The accident record of reputable owners (for example, Exxon, Japan Lines and Peninsular, and Orient, to name a few) is excellent regardless of the age, size, or flag of vessels involved.

Reputable owners insist on and enforce rigid standards for qualification and licensing of their crews. In addition, such owners were found to require that ship personnel receive thorough and ongoing training. As a further incentive to safety, some operators also insist that chartered vessels be required to meet high standards of safety and qualifications, treating chartered vessels as if they were part of their own fleet.

The next major factor I found was the character of the nation of registry. Principally.

Roger A. Peterson, an Associate Professor of Marketing and Transportation at Eastern Michigan University, conducted a worldwide study of serious maritime oil tanker accidents occuring between 1964 and 1977. The resulting paper, from which this article was adapted, was presented at the October 22, 1981, meeting of the Great Lakes Section of the Society of Naval Architects and Marine Engineers, held in conjunction with the centennial of naval architecture and marine engineering at the University of Michigan.

this relates to the manner in which the flag state administers and enforces safety measures, either its own national regulations or internationally accepted and ratified standards.

An article on this subject, "The Year of the Tanker, But Mostly for the Wrong Reasons," appeared in the July 17, 1980, issue of *Fairplay International Shipping Weekly*. Evidence cited there indicates that a number of nations (in particular Liberia, Panama, and Greece), while accepting and ratifying international standards of licensing, safety, and inspection, are not making any appreciable progress in improving their safety record. This failure can be attributed to the fact that these nations lack the resources and the administrative machinery required to effectively control such matters. The process of vessel monitoring and vessel inspections has been left almost exclusively in the hands of the classification societies. While certain ship inspection personnel may receive designations as inspectors for these countries, there are no standards or exams for appointment. Recent years have seen a mounting barrage of criticism arising over these practices. In particular, critics have focused on the issues of secrecy and differences in standards between various classification societies.

This can be a very dangerous procedure because these countries lack an effective enforcement agency (such as the United States' Coast Guard). Since these countries enroll tonnage far in excess of their national requirements, many if not most of the vessels under their flag rarely visit the ports in which they are registered. Thus, even if the governments wish to monitor vessel condition, they must do so at ports in other countries. While such a system is possible, it is expensive and difficult to administer and operate effectively.

This tanker, now in two pieces, was bound for Salem, Massachusetts, with a cargo of about 7.3 million gallons of heavy industrial fuel oil when it ran aground on December 15, 1976, causing a major oil spill.

While criticism can and should be leveled at the licensing of ship's officers in almost every nation (because so many lack a requirement that applicants demonstrate practical shiphandling ability), the open-registry nations are particularly deficient in this area. They have a history of adopting a careless approach to the issuance of licenses, issuing credentials on the basis of documents presented as proof, and doing little in the way of checking for authenticity or investigating the character and background of applicants.

In fact, the very existence of open registries poses a serious problem in regard to the issue of safety. Even if one accepts the argument that public pressure has caused Liberia and Panama to improve their systems and that Greece's accession to the European Community will result in an improvement in its system, a problem will remain. The owners of substandard tankers can merely transfer their ships to other emerging open registries (the Bahamas, Bermuda, the Cayman Islands, the Maldive Islands, Somalia, the Seychelle Islands). Even Vanuatu (formerly the New Hebrides), an island nation of only 110,000 people, has announced such a registry and opened a registration office in New York City.

Age was the most prominent vessel-related factor encountered, as older tankers were found to represent the greatest opportunity for loss. The danger begins when a tanker is in the vicinity of 10 years of age and becomes particularly critical in the range of 16 - 20 years of age. Tankers in these age brackets must be maintained in accordance with strict standards of upkeep if breakdowns and accidents are to be avoided. There is strong evidence to indicate that in many instances such is not the case. Certain owners are allowing these older ships to run down and gambling with safety to make money.

While the size of a vessel did not turn out to be a major factor in the frequency of tanker accidents, there is evidence to indicate that it may well be a factor in the severity of an accident. When VLCCs (Very Large Crude Carriers) or ULCCs (Ultra-Large Crude Carriers) get into trouble, the salvage equipment needed to save them is large, sophisticated, and expensive. According to an article in the May 4, 1981, issue of the *Journal of Commerce*, this type of equipment is becoming scarce. Owners of such equipment maintain that the equipment's increasing cost and the increasingly complex environment in which they must operate prohibit further investment. They say major changes are required.

My research also indicated that there are gaps in our knowledge. We lack much in the way of maritime casualty data coverage and dissemination. The human aspect of casualties is an unexplored and greatly neglected area. Little attention has been given to this factor, and we know little about it. This is somewhat surprising, for almost all studies and works in the area of marine casualties point to human error as the cause of the majority of accidents. Further, there is presently no uniform worldwide system for reporting casualties. Consequently, it becomes difficult and expensive to reconcile the many systems, and much of the information is lost. In my study of tanker casualties, for example, the lack of uniformity made it impossible to determine the impact of location on tanker accident frequency.

Recommendations

If we wish to minimize tanker accidents and their consequences, a two-pronged effort will be required: immediate short-term actions designed to have a quick impact and based on what we do know must be coupled with long-term research, especially research into those areas where our knowledge is limited.

Short-term Actions

The first area for immediate action should be that of ownership. Nations must recognize that this is the area offering the best opportunity to administer and enforce safety standards for tankers. However, to accomplish these goals they must be able to identify those who actually control a vessel. Therefore, it is necessary to correct the present situation, in which true ownership and control is sometimes hidden within a maze of interlocking companies. If necessary, the ships of nations which refuse to require identification of owners should be barred from entering other nations' waters. Once identification of ownership has been accomplished, it should be followed by a program of enforcement. Not only should crewmembers be subject to fines and imprisonment for violations of safety standards, but owners and operators also should be held liable. Vessels in substandard condition and their owners must be identified so that steps can be taken to remove the vessels from service and force the owners out of business.

Owners and/or operators who choose to disregard the issue of safety and proceed to operate dangerous vessels should be made liable for their actions in this regard. Evidence of deliberate disregard for safety and environmental concerns by managers, owners, or crews should be grounds for fines, imprisonment, or revocation of the right to operate.

Methods of communication between nations must be developed so that owners under investigation or conviction cannot simply transfer their vessels to a new flag. One proposal, advanced in the May 4, 1978, issue of *Fairplay International Shipping Weekly*, appears to be an excellent one. Under that proposal, a record would be kept of tankers and their safety record. This would permit another recommendation to be put into effect, that of a common chartering policy, suggested by F. M. van Poelgeest, a researcher for the Netherlands Maritime Institute. Under his system, there would be a worldwide common chartering policy for tankers. Before any tanker was chartered, its charterers would investigate the vessel's casualty record, crew competence, vessel condition and inspection condition, and the past record of its owners and/or management.

Actions should also be taken against nations which turn a blind eye to substandard tankers operating under their flag and nations which freely allow the entry of such vessels into their registry. Barring such a nation's ships from trade and/or ports of other states is one such measure.

In regard to crew qualifications, the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, 1978 is a step in the right direction, but we must follow through with it and improve upon it. All nations should be striving for a set of uniform standards for crew examination, physical fitness, and a demonstration of practical

READEX FICHE best copy available

competence by officers, perhaps by means of simulators.

In addition, special endorsements and examinations should be required for various categories of ships and ship sizes. Licenses should be issued for a specified term and require a physical examination for renewal as well as some proof of current competency either by certified service or by examination.

Nations must recognize that while there is nothing inherently wrong with the use of reciprocity in the issuance and acceptance of licenses between nations, checks and safeguards must be employed. First, before any nation issues a license on the basis of another nation's license presented by an applicant, it must establish the authenticity of the credentials and satisfy itself as to the good character of the applicant. While such a background check may take time and cause inconvenience, such problems can be minimized by making the initial license issued a temporary one good for only a very short period. During this period the applicant is investigated, and the license is either revoked, allowed to lapse, or replaced by a permanent one.

It is far cheaper and easier to prevent a tanker accident than it is to clean up the pollution following a loss.

Second, when nations cancel licenses or take other major disciplinary action, they should ensure that information regarding such actions is made readily available to other nations. Such action will make it much more difficult for crewmembers to evade punishment by holding licenses from multiple nations.

In regard to vessel condition, a worldwide system of vessel standards and inspection procedures should be established. These standards and procedures should be developed and detailed at the government level.

The inspection of vessels can be left in the hands of classification societies but must be monitored and spot-checked by government-employed inspectors. Any inspector, either government or privately employed, should be certificated and appointed only after careful screening and examination. Lapses of performance by such personnel should be dealth with by fines, suspensions, or revocation of appointment, as appropriate. Classification societies' operations must be carefully monitored and controlled. Any conflict of interest between their responsibilities as inspectors and their responsibilities as agents of shipowning firms must be prevented by regulatory action, if need be.

Since age is a significant factor in the frequency of serious tanker casualties, special programs of inspection and monitoring must be devised for older tankers. Inspections of such vessels must be more frequent and more detailed.

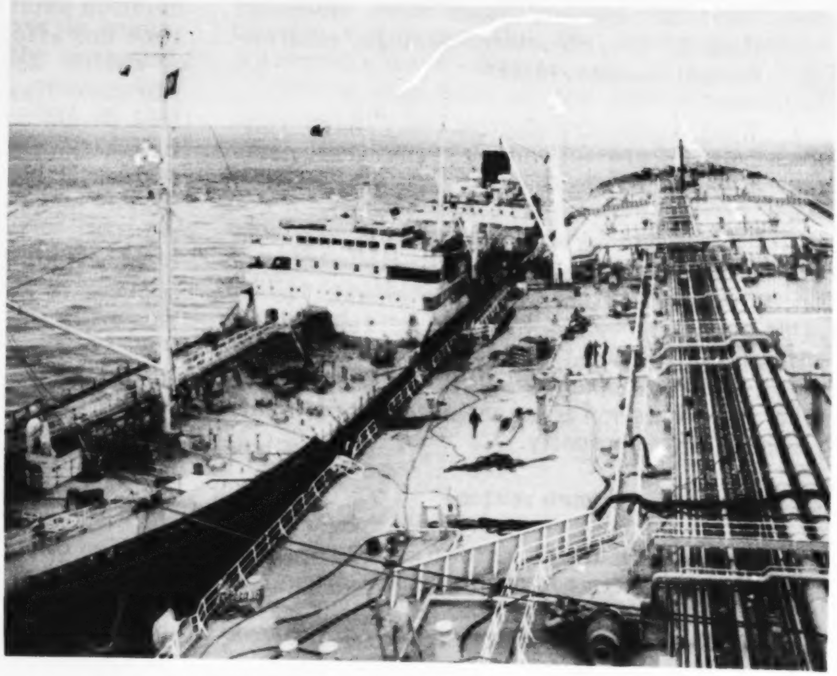
The question of whether such measures are taken may prove to be crucial in the immediate future. The world tanker market is fragmented, and tanker demand has changed drastically. Supertanker supply exceeds demand because of the great number of small cargoes being moved. Consequently, new supertankers are operating at a loss while older, smaller tankers are making profits. If this situation continues, the number of older and smaller tankers being kept in service will increase.

If this situation and its attendant problems are to be resolved, classification society inspections must be backed up by a program of government-conducted inspections. Such inspections can and do have an effect. After 18 months of operation, the tanker boarding and inspection program of the U.S. Coast Guard showed distinct results. The number of safety violations found decreased, and many tankers cited for numerous safety violations left the U.S. trade.

Governments should also recognize that all nations and particularly coastal nations have a vital interest in preventing tanker losses. Since economic and environmental concerns often conflict, governments should be prepared to intervene as necessary. The actions in this regard taken by the French and Somalian governments in hiring salvage tugs to stand by dangerous traffic areas is one such step. It is far cheaper and easier to prevent a tanker accident than it is to clean up the pollution following a loss.

I recommend a program in which governments would agree to cooperate and share the costs of salvage equipment and facilities. For example, it would be in the best interests of many nations to avoid accidents in the English Channel. It would thus appear advisable for a number of countries to collectively agree to provide and fund the equipment and facilities necessary to ensure adequate protection for this area. Another action, suggested by a salvage expert, is that certain areas and ports be designated and equipped as havens and refuges for stricken tankers. Such action would reduce confusion and facilitate the salvor's task.

The role of the International Maritime Organization also requires modification. IMO should be given the power to monitor and enforce compliance. Member nations should no longer be allowed to make only a show of compliance. The Maritime Safety Corps should be expanded and its present passive and advisory role modified so that the Corps would function as an inspecting and monitoring agency, reporting noncompliance and violations by member nations. IMO should be given authority to use fines, suspension, and expulsion against members that do not comply with the safety measures that have been ratified.



The 206,000-ton VLCC on the right dwarfs the 19,000-ton tanker which has come to off-load its cargo. The VLCC was carrying 1.58 million barrels of crude oil before it ran aground; 300,000 leaked into the water, polluting 40 miles of shoreline.

The achievement of these goals is bound to be difficult because of the politics involved. IMO is a political creation and politically motivated. If the United States, Canada, France, and other safety-oriented nations use both their political power and their economic power, however, they can force changes to be made. The developed nations which regulate their fleets possess tremendous economic and political leverage. It is the attitude of the United States and France and their threats of severe unilateral action that have created an atmosphere in which certain conventions and expensive retrofitting measures have been accepted in the name of safety.

Long-term Actions and Future Research

My study pointed to two areas of research which should be explored further: information on casualties and the role of human factors.

We lack detailed, usable information on maritime tanker casualties. This situation has become serious enough to justify concern and discussion at a major conference of the tanker industry, the Safe Navigation Symposium held by the Oil Company International Marine Forum in January 1978. The data that are available are all too often incomplete or outdated, making analysis difficult. Further, there is a lack of standardized definitions and terminology. As a start, we need a commonly accepted definition for "serious accident." Since it is impossible to cope with every possible contingency, we must have a system of priorities to help us distinguish between major and minor concerns.

We also need to develop common and accepted definitions for vessel class and size limits so that it will be easy to use data from differing sources in an efficient manner. Without such standardization, it is difficult, if not impossible, to use data derived from different sources.

Finally, information is required in sufficient detail to enable us to answer the following questions about any tanker accident:

- What caused the accident? (Human error, mechanical, failure, etc.)
- What type of accident resulted? (Grounding, collision, etc.)
- What events followed the accident? (Oil spill, explosion, etc.)

- What damage and losses were involved? (Loss of life, structural damage, environmental damage, etc.)

- What secondary factors may have contributed to the accident? (Weather, navigation aids, etc.)

If these questions are to be answered, we need an orderly and systematic method for collecting casualty information. While not intended to be exhaustive, the following list, developed by William O. Gray, Senior Adviser for Marine and Terminaling at Exxon Corporation, shows what type of information is essential for proper analysis of a tanker casualty.

Human factors

Was the Master on watch?
If not, who was in charge of watch?
  His rank
  His training and experience
  Fatigue factor
Was a pilot aboard?
If so, did the pilot have the conn?
Were proper procedures followed?
Training and experience of crew
What country issued the original license?

Vessel factors

Design (clean tanker, dirty tanker, combo)
Size
Product on board (crude, refined, etc.)
Equipment status (navigation, cargo, machinery, etc.)
Maintenance and repair status (age, overall condition)
Flag of registry

Environmental factors

Time of accident
Weather conditions
Location (at sea, coastal, in-port)
Other vessels involved

The human side of tanker casualties has been seriously neglected. While almost all authorities agree that human error is a major cause of tanker accidents, little has been done to identify the reasons why this is so or what steps could be taken to improve the situation.

I believe that we should take the aviation industry as a model. The human factor has long been recognized as a crucial ingredient in any aviation safety program, and large amounts of time and effort have been devoted to its study. A similar approach should be adopted in the maritime field, and the concept of human factors should be accepted as one of major importance. We need to objectively study human factors in the context of the design and operation of tankers. Further, it is absolutely essential that more work be done in the area of the Master-pilot relationship, a relationship that appears to be a particularly frequent factor in casualties.

Implications

I concluded from my study that the major factors in the frequency of oil tanker accidents are:

Who owns the tanker?
In what nation is it registered?
How old is the tanker?

The implications of the importance of these factors are somewhat ominous. The first generation of VLCCs is already in the over-10-years-of-age category and in a few years will be reaching the 16-and-over age group. The first ULCCs are now entering the 10-years-and-over category, and some are already being sold off or scrapped. If these huge vessels are allowed to deteriorate and nonetheless remain in service, the potential for disaster will be great.

While the statistical data in my study goes only as far as 1977, events since then have been far from encouraging. Oil tanker accidents hit a new high in 1978 and then went even higher in 1979, the worst year ever for tankers. Major accidents alone accounted for the loss of 12 tankers totaling over 1.9 million deadweight tons.

Unless things change, society faces a twofold threat. Many tankers entering the dangerous-age categories are of increasingly large size. Thus, when they get into trouble they are harder to save or salvage. Since they also contain more oil, they pose a bigger pollution threat.

A Closing Note

My research indicates that oil tanker accidents can be minimized. While it is not reasonable to expect that there will never be an accident, preventive measures can reduce the risks involved in this type of operation. Liquefied natural gas tankers, for example, have a very good safety record *(see the article beginning on page 305).* Recognizing the potential for disaster presented by their cargo, the owners, insurers, operators, and crews of the LNG ships have worked together to develop a set of stringent standards for the design, construction, and operation of these ships as well as equally strict standards of qualification and training for their crews. Since 1959 these vessels, 10 in number, have made over 2,700 voyages with only one serious incident and without the loss of a single vessel. In the one serious incident that did take place, the grounding of the LNG carrier EL PASO PAUL KAYSER, experts agree that the extensive training and preparation that had gone before prevented a major disaster.

(For a discussion of the safety record of chemical tankships, see box below.)

If the lessons from this study are taken seriously, future research is carried out, and corrective actions are taken, there is no reason why equally impressive results cannot be accomplished with oil tankers. On the other hand, if it is felt that no special measures need to be taken and that maintaining the "status quo" is an acceptable course of action, the future can hold only an increasing number of tanker accidents.

High risks make for a low casualty rate

Chemical tankships have an admirable safety record. This is perhaps surprising in view of the potential hazards associated with shipping chemicals. The transport of chemicals is more complicated than the transport of oil (crude/product) for a number of reasons:

- First, the primary hazard to be dealt with on crude/product tankers is flammability. Chemicals, on the other hand, may be not only flammable but also toxic, corrosive, self-reactive, and reactive with water, air, and common materials of construction.
- Second, unlike crude/product tankers carrying one or two products (exhibiting similar hazard characteristics), the chemical tankship may carry 10 to 20 different products on each voyage, some of which may be flammable, some of which may be toxic, and some of which may be reactive.
- Finally, it is common practice for chemical tankships to change cargoes from voyage to voyage. In many cases, this calls for tank cleaning procedures even more sophisticated than those used on crude/product tankers.

These differences, and the complications which they can cause, pose threats to the safety of personnel and the environment beyond those posed by crude/product tankers. The transport of chemicals thus requires measures of control beyond those provided by the Safey of Life at Sea (SOLAS) convention.

The Coast Guard regulates the shipment of chemicals in bulk on chemical tankships in Part 153 of Title 46 of the Code of Federal Regulations (46 CFR 153), "Safety Rules for Self-Propelled Vessels Carrying Hazardous Liquids." These regulations implement the internationally accepted standards of the International Maritime Organization (IMO) Chemical Code. All foreign-flag vessels transporting bulk chemicals and liquefied gases in U.S. waters are certificated and inspected under the Letter of Compliance (LOC) program administered by the Coast Guard's Marine Technical and Hazardous Materials Division. This program ensures that, for each chemical to be carried, the ship meets the design standards specified in the IMO Chemical Code and 46 CFR 153. These standards cover ship type, tank type, venting, tank environmental control, electrical instrumentation for hazardous areas, level control, vapor leak detection, and firefighting systems. The standards are maintained by stringent regular inspections of the LOC ships by local marine inspectors.

The LOC program, combined with the relatively young age of the present chemical tankship fleet and the industry's incentive to protect its sizable investment in the design and operation of chemical tankships, has served to effectively counteract the risks inherent in transporting chemicals by ship.

How Mobil Manages to Improve Safety

by Captain J. V. Caffrey, USCG (Ret.)

In the never-ending attempt to reduce casualties and polluting incidents at sea, most ship operators have adopted safety programs of varying styles and content. Many attempts to improve safety have been ad hoc in nature, made in response to the crisis of the moment, whether it be "radar-assisted collisions," "intentional discharge of tank washings," "propulsion failures," or the like. While many such responses have served their purpose, this approach lacks the element of planning and anticipation which is so vital to achieving the goal of safer and cleaner seas.

Accordingly, we at Mobil have chosen the word "comprehensive" as best describing the desired approach to safety. We view safety in its broadest sense. In marine operations, safety is made up of the following elements: the ship and its hull integrity, the machinery/equipment and its proper maintenance, and the people (crew) and their competent performance. None of these components can be treated in isolation if we are to achieve the desired degree of safety. Interwoven in our safety concept are the related concerns of industrial hygiene and protection of the environment.

Although all of this might sound like a cumbersome package, it is in reality a very manageable one. Safety can be defined as "the control of accidental losses." Unsafe conditions, known or deduced, can be addressed by new strategies and actions which we can plan, program, and budget for. Planning enables us to apply risk-analysis techniques to come up with preventive measures of acceptable cost. Such measures might range from discontinuing a practice or operation at one end of the spectrum to retaining the practice but introducing engineering controls at the other, with various safeguards and precautions in between.

Such a scheme requires the participation of a large number of players. Continuing communication among them is a must. Within Mobil, the broad corporate directives on safety are written down in a series of Management Guides containing general requirements applicable to all facilities and affiliates. Compliance is effected through safety groups in each of the divisions. In marine transportation, experienced personnel serve as both vessel inspectors and program administrators.

The Program

For any company operating tankers, towboats, and barges worldwide, incidents involving injuries to personnel, occupational illness, marine property damage, and marine environmental pollution are always a possibility. The goal of the Mobil Marine Safety Program is to minimize the frequency and severity of such incidents.

The principal elements of Mobil's Marine Safety Program are:

1. Vessel safety inspections
2. Vessel industrial hygiene inspections
3. Crew training in safety-related skills
4. Coordination of ship/shore safety meetings

This article was adapted from a paper delivered by Captain Caffrey at the 1982 American Petroleum Institute Tanker Conference, held May 9 - 12, 1982, in Boca Raton, Florida. Captain Caffrey is Manager of Maritime Relations for Mobil Oil Corporation.

In support of our safety program, we also:

1. Participate in government and industry forums,
2. Assist in the development of new technology in safety and industrial hygiene,
3. Assist fleet managers in special circumstances,
4. Analyze accident/injury statistics,
5. Implement performance recognition programs, and
6. Produce safety and health publications.

I have chosen three of our activities to describe in greater detail.

Vessel Inspections

On-board vessel safety inspections are conducted on all Mobil-owned vessels. The tasks assigned to the inspector are as follows:

TASK ONE:	To ensure that safe practices and procedures are followed in all operational and maintenance matters
TASK TWO:	To ensure that hazards to personnel are reduced to the minimum possible levels
TASK THREE:	To ensure that all lifesaving and fire protection systems operate and are in conformance with the standards of the Mobil Tanker Manual and are maintained in satisfactory material condition
TASK FOUR:	To report on noted deficiencies and assist fleet managers in instituting corrective actions

MARITIME DAY

Walter C. Mink, Jr., President, Mobil Shipping and Transportation, accepts the AMVER Award from VADM R. I. Price, USCG.

The interaction between our safety inspectors and ship's personnel is of paramount importance. Our men go aboard not so much to find out what is wrong but, together with the Master and crew, to identify weaknesses which can be eliminated. We attempt to create an atmosphere in which all issues will be voluntarily disclosed and corrective actions amicably initiated. We strive to increase safety awareness and get across the message that safety and good seamanship are synonymous, so that the benefits of the inspection visit endure beyond the visit itself.

The time the inspector spends on board ship with the crew and hardware is the single most important part of the program. The inspector will join a vessel for three to five days, which will include both in-port and at-sea periods, enabling him to observe the interaction of people and hardware over the full range of vessel operations. Although this inspection is personnel- and equipment-oriented, the examinations include walk-throughs of all available spaces within the ship so that the inspector can examine general material conditions as well as the operating status of the firefighting, lifesaving, and other emergency systems. The status of such health-related features as sanitation, noise levels, toxicity, light, heat, and vibration is also noted. All vessels are scheduled for a full industrial hygiene baseline survey. On these surveys, the safety inspector, who is qualified as an industrial hygiene monitor, is accompanied by a certified industrial hygienist from the corporate staff.

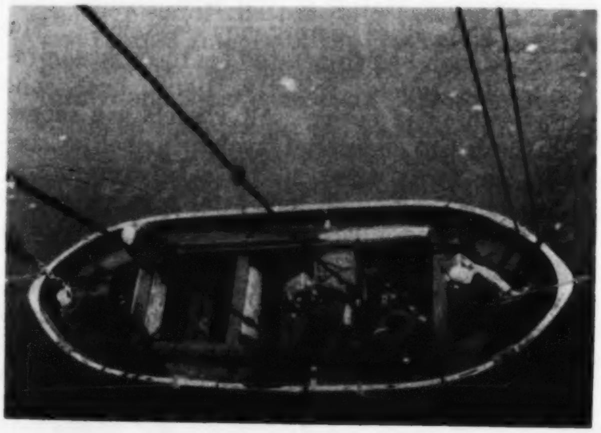
All pertinent observations are recorded. For this purpose we have developed a standard inspection-report pamphlet which is completed by the inspector during the trip. He notes his findings and includes suggestions for improvement, as may be appropriate. His comments are not limited to negative findings; he will also report, for example, that an observed operation, such as mooring, taking a pilot on board, or transferring cargo, was handled in conformance with the doctrine of the Mobil Tanker Manual (our comprehensive manual prescribing all shipboard functions).

Prior to leaving the vessel, the inspector will discuss his findings with the Master. Since deficiencies may have been identified, the key to the success of the program is handling the matter in such a way that the whole event is viewed as being of benefit to the crew and the ship. The report is sent to the fleet managers, who review it with their staffs and determine the action to be taken. Some items are referred back to the ship to be carried out, others to purchasing agents for contracting. Still others are deferred until the next shipyard repair period. In any case, the safety group is kept informed and is able to maintain a progressive record of each Mobil vessel.

. . . safety and good seamanship are synonymous . . .

The credibility of the program derives from evidence visible to the Master and crew that action is taken, at whatever level is appropriate, to put deficiencies in order at the earliest practicable time.

We emphasize the progressive nature of the operation. The first inspection is the most difficult. Later inspections benefit from the prior documentation and the records of interim actions. The frequency of inspections serves to preclude the unexpected, and we normally do not uncover any major defects.



A standard criticism of lifeboat drills is that they are pointless if later, during an emergency, the lifeboat is frozen in the davits or the engine does not work. In Mobil's drills, boats are lowered into the water and their engines tested.

Crew Training

Tasks to be carried out under this part of Mobil's safety program are:

TASK ONE: To conduct training in safety, health, and emergency procedures with the crew during vessel inspection visits

TASK TWO: To provide a resource to serve with industry groups which are developing training programs and courses

TASK THREE: To promote the assignment of key personnel to shoreside training facilities such as firefighting, medical assistance, radar, and tanker safety schools

Training's tie-in to safety is that the crew must be able to perform in an organized and efficient manner with the equipment at hand. Training is therefore an ancillary function to inspection. Safety instruction is provided in asociation with emergency drills and exercises, abandon-ship procedures, and the use and handling of all firefighting and lifesaving equipment. Emergencies are simulated to give crewmembers realistic experience. Some drills are scheduled beforehand and are conducted to satisfy company and regulatory requirements. Others are unannounced and serve to test readiness in unexpected emergencies. In all cases, critiques following the drills are used to evaluate the benefits derived, as well as identify any deficiencies of conduct or equipment. Any action to be taken is instituted before the shiprider disembarks. The appearance of the safety inspector on a periodic basis encourages automatic response in all of the above areas.

In our view, refresher training has no equal.

Great emphasis is placed on the need for firefighting training, both aboard ship and ashore at fire schools. Our aim is to see that all Mobil crews are trained and confident firefighters. Other shoreside training stresses bridge organization (teamwork) and voyage planning. Recognizing that collisions and groundings are two of the most prevalent types

Watch Officer Siegfried Zoernack helps adjust a Draeger compressed-air breathing apparatus on the back of the No. 1 pumpman during a lower level pumproom rescue drill. Later, he instructs and directs crewmembers after the "victim" has been recovered from the lower level of the pumproom.

of casualties, the vessels' navigating teams are all given the chance to work with shiphandling and radar simulators. In our view, refresher training has no equal.

Over the past five years, Mobil's training budget, on the average, has exceeded $500,000 annually. We believe that we can attest to value received.

Performance Recognition

No program can succeed without a strong demonstration of support from top management. If efforts to improve safety go unrecognized, employees will rapidly lose interest—or remain indifferent from the start. Although we do not employ any of the incentive or reward programs, we acknowledge excellence in the area of safety in a number of ways. Among these is our participation in the National Safety Council and American Institute of Merchant Shipping awards contests, which bring winners the recognition of their peers. The AMVER system for ship locating is another program where faithful participation is recognized. In addition, we have internal programs. Lesser but still noteworthy performance is recognized by modest, company-styled awards, such as framed photos of the ships involved. All activities in connection with the presentation of these awards are photographed, and an account of them appears in Mobil publications. Since formal initiation of the Marine Safety Program, the number of awards earned has been on the rise.

Conclusion

Mobil's comprehensive approach to shipboard safety attempts to incorporate all significant elements of marine safety. We believe that safety should be managed like any other company function. The safety effort should be planned and organized to achieve desired results.

It must be recognized, however, that safety is difficult to quantify. Questions arise as to whether the perceived dividends justify costs. The issue is further clouded by international conventions and domestic regulations which impose costs separate from those of our own programs. How do the results of enforced measures compare to those of voluntary schemes? Things of this nature make it difficult to develop proposals for management decisions.

We suggest that safety planners sketch a basic outline, perhaps patterned on the Mobil Plan. Resources can then be allocated according to the size of the fleet and the disposition of top management. Given the cooperation and encouragement of the senior people, it is a simple matter to insert the appropriate resources (dollars and people) to arrive at a suitable plan.

Our methods parallel those advocated in the "Code of Good Management Practice in Safe Ship Operation," published jointly by the International Chamber of Shipping and the International Shipping Federation. These organizations, like Mobil, stress the importance of communication up and down the line from senior shoreside management to junior shipboard rated personnel.

By adopting these concepts, we have affirmed our commitment to safety. Has the "payback" met our expectations? Thus far, we are pleased with the results; the record is good. Not that we are satisfied to the point of complacency—our efforts must be ongoing and improvement continually sought. At the moment, however, Mobil ships are safe places to work; they are not polluters, and we have had no record of any recent casualties. We are doing our utmost to keep it that way.

Companies or individuals wishing to know more about Mobil's Marine Safety Program should contact Captain Caffrey at Mobil Oil Corporation, Marine Transportation Department, 150 East 42nd Street, New York, New York 10017; (212) 883-5548. ‡

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The following two items are reprinted with permission from the Chevron Shipping Company's Safety Bulletin.

Cover up and Button up for Safety under Bridges

In March 1982, an explosion occurred on a coastal gasoline tanker while it was passing under New York's Williamsburg Bridge. The explosion killed the Chief Engineer and sank the vessel in the East River.

The tanker was empty at the time, having discharged its gasoline cargo earlier. It was reported that the cargo tank hatches were closed but not dogged and the ullage screens were in place on the open ullage holes. The explosion was linked to "hot work" construction on the bridge. It was theorized that slag or sparks fell from the bridge and ignited cargo vapors at the tanker's deck.

* * *

A fleet manager recalls a trip on the Connecticut River aboard a gasoline barge many years ago. It was July 4, and the local kids celebrated by tossing lighted firecrackers onto the barge from a bridge.

* * *

Tanker people should keep in mind that whenever their vessel passes under a bridge it is a potential target for objects dropped or thrown from the bridge; the danger is the same whether it happens by accident or on purpose.

Take commonsense precautions for safety under bridges. Secure the cargo tanks and get under cover.

Someone up there may be careless—or may not like you.

Tend the Lines

A recent accident involving a VLCC (non-Chevron) at a crude terminal (also non-Chevron) illustrates the extent of damage that can result from inattention to mooring lines.

According to the report, the VLCC was alongside a jetty, discharging. The vessel moved out of position and, in the process, broke a loading arm. Crude oil flooded onto the vessel and the jetty. Fire broke out.

The vessel was taken off the jetty, and the fire aboard was brought under control by ship's staff. The jetty was almost totaled by the fire. The damage was estimated at $12 million, and the jetty was put out of service for one year.

The Officer of the Deck on a tanker moored alongside and transferring cargo has to be ready to anticipate changes in tide, wind, and current, alterations in draft, and the effects of passing traffic on his vessel's moorings.

He must take whatever measures are necessary to ensure that his vessel is kept secure to the berth.

He must tend the lines. ‡

The LNG Peril: Fact or Fiction?

by Robert J. Lakey

From the beginning, safety has been the major consideration in liquefied natural gas shipping. This is best evidenced by the excellent safety record the industry has established. Yet, no other form of shipping has come in for greater criticism. LNG accidents seem to be a favorite subject of writers of disaster epics. Such fictional accounts, while they make for gripping reading, are based on improbable premises and do not reflect industry practices. The purpose of the following article is to present an overview of the LNG shipping safety record. It is the author's hope that it will eliminate any doubt as to its excellence.

The technology involved in transporting LNG had its start near Lake Charles, Louisiana. There, some 30 years ago, a group of scientists and engineers gathered under the sponsorship of the Union Stockyard of Chicago to investigate the possibility of transporting LNG by barge. The project's plan was to liquefy natural gas and transport the LNG by barge to the stockyard. The stockyard planned not only to use the LNG as fuel but also to make use of its "cryogenic value" (or low temperature) in refrigerating its meat. This far-sighted project did not come to fruition, but it did establish many of the basic guidelines followed in LNG ship design today.

The first shipment of LNG took place in 1959 when the METHANE PIONEER transported 5,000 cubic meters of LNG from Lake Charles to the Canvey Island terminal located just outside London in the Thames River. The METHANE PIONEER used a cargo containment system that can be considered a direct offshoot of the earlier Lake Charles investigation. The METHANE PIONEER made several trips across the Atlantic and clearly established the feasibility of safely transporting LNG by ship. (The METHANE PIONEER remained in active service for many years before being retired to floating storage service.)

The first commercial LNG project began in 1964. It involved transporting LNG from the Camel plant in Algeria to the Canvey Island terminal. Two 27,400-cubic-meter ships, the METHANE PRINCESS and the METHANE PROGRESS, were built specifically for the transport of LNG. Their cargo containment system designs evolved from the system used in the prototype METHANE PIONEER. The

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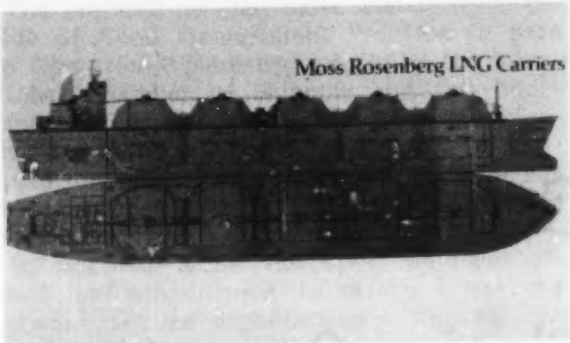
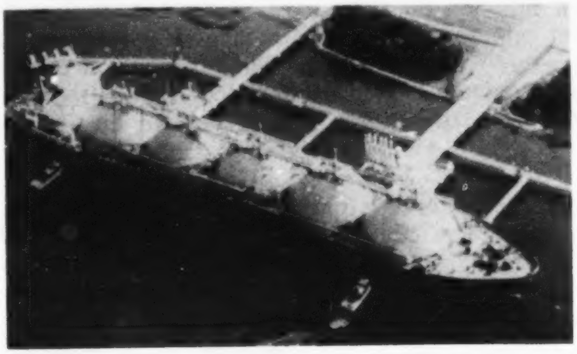
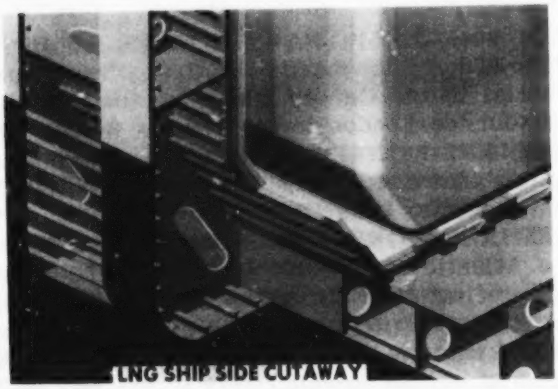
Robert J. Lakey is President of Robert J. Lakey and Associates, Inc., Marine Consultants, of Houston, Texas. This article is adapted from a paper he delivered at the 5th Annual Energy-Sources Technology Conference & Exhibition, Pipeline Engineering Symposium, held in New Orleans March 7 - 10, 1982.



The Moss Rosenberg spherical system has been dubbed a "no leak" tank design. Engineers have studied the system and satisfied themselves that a) any leak would be picked up by thermal and gas detection systems and that b) the design of the tanks is such that it would take years for a crack to reach the point where a tank would spill its contents.



The figure on the left shows a side profile and arrangement of Moss Rosenberg's pressure vessel-type LNG cargo tanks. The ship in the photo to the right is the 125,000-cubic-meter GOLAR FREEZE, a Liberian-flag LNG tanker built in 1977. (Ten U.S. LNG ships, built by General Dynamics/Quincy, are equipped with this system.)



This cutaway shows the side of a double-hull LNG ship. The LNG is carried in independent cargo tanks like the one occupying the upper right-hand quarter of the picture. The tank sits freely on "structural support keys," a feature which allows the tank to expand or contract with temperature changes. The layer of insulating material around the tank protects the steel used in the rest of the ship from the extremely low temperatures at which the LNG is kept. The spaces between the tank and the sides and bottom of the vessel afford the tank protection in the event of a collision or grounding. To date, no LNG tanks have been punctured in the three such major accidents which have occurred.

METHANE PRINCESS and METHANE PROGRESS have been in continuous service since 1964, making over 800 voyages from Algeria to Canvey Island. They have transported over 21 million cubic meters of LNG.

In 1965, the JULES VERNE (25,800 cubic meters) began carrying LNG between Algeria and France. The JULES VERNE remains in active service on that route today. The entry of the JULES VERNE into service marked the beginning of the French shipbuilding industry's dominant role in LNG tanker construction.

Between 1965 and 1970, LNG shipping was limited to the Algeria-Canvey Island and Algeria-France routes. This is not to say that there was no other activity; it was simply more of a planning and designing nature.

The period of greatest activity began in 1970. Two 71,500-cubic-meter ships went into service in the U.S./Japan trade, marking the beginning of the LNG supertanker era. By 1975, seven 75,000-cubic-meter LNG ships were operating between Brunei and Japan, and in 1978 the first 125,000-cubic-meter ship began to operate. During the period 1970 - 1980, some forty 120,000-cubic-meter (or larger) LNG ships were constructed or placed on order.

The period 1965 - 70 was also one of great advancement in LNG containment system technology. Engineers and naval architects throughout the world focused on LNG technology. Four basic containment systems evolved:

(1) Moss-Rosenberg Spherical System (Norway)

(2) Conch System (U.K.)

(3) Technigaz Membrane System (France)

(4) Gaz-Transport Membrane System (France)

As can be imagined, when the orders were placed for the larger ships, there was keen competition between the makers of the various systems.

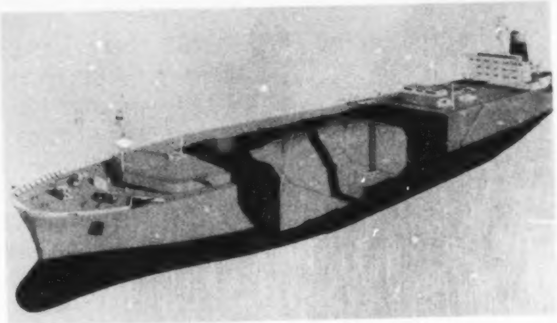
At the beginning of 1982, there were 71 LNG ships either in operation, laid up awaiting service, or under construction. Forty-seven of the ships have a capacity of 120,000 cubic meters or more. The breakdown by type of containment system used is as follows:

Moss-Rosenberg Spherical	23
Gaz-Transport	19
Technigaz	5

(In addition, three large ships were ordered with the Conch system. These three ships were not completed because of a failure of the polyurethane insulation.)

The operating history of the Moss-Rosenberg and Technigaz containment systems has been good. Users of the Gaz-Transport system experienced some difficulties. The difficulties did not affect the safety of the ships, but significant modifications had to be made for each ship if the ship was to remain in service. These modifications have now been made, and the ships have returned to satisfactory service.

The NORMAN LADY is an 87,000-cubic-meter LNG/LPG carrier. It, like the GOLAR FREEZE, uses the Moss Rosenberg system, but its spherical tanks are covered with flat plates.



Gaz Transport uses a membrane system for its LNG tanks; this consists of a primary barrier, a layer of insulation, and a secondary, back-up, barrier. This cutaway shows what is in essence a "two-tank system." If the inner wall is damaged, the outer tank is designed to hold all leakage. In some of the early designs, sloshing of the LNG resulted in damage to the inner tank walls. The outer wall held all leakage until the cargo could be safely off-loaded. (Current designs have substantially eliminated this problem.)

It should also be noted that there are other cargo containment systems available which have received government and classification society approval. Notable among these is the McDonnell Douglas/Gaz-Transport system. This system was designated for use in the Pacific Lighting/Alaska Project, which has yet to materialize.

The Record Today

It is estimated that since 1964 LNG ships have made over 5,400 ocean voyages, safely transporting in excess of 280 million cubic meters of LNG. (The gas equivalent is 6.2 trillion cubic feet.)

LNG is currently exported from 10 liquefaction terminals. These are located in the United States, Abu Dhabi, Algeria, Brunei, Indonesia, and Libya. There are 16 receiving terminals, located in the United States, France, Italy, Japan, Spain, and the United Kingdom.

LNG ships are also involved in several projects currently under development. Among these is the Arctic Pilot Project. This project is unique in that icebreaker-type LNG ships will be used to transport the LNG from Melville Island, deep in the Arctic, to an eastern Canadian port.

The LNG Tanker Safety Record

During the period 1965 - 1981 there were 16 casualties involving LNG tankers. The casualties are summarized in the table to the right. Among the more notable are the grounding casualties involving the EL PASO PAUL KAYSER in 1979 and the LNG TAURUS in 1980.

The EL PASO PAUL KAYSER was grounded on La Perla in the Strait of Gibraltar on June 29, 1979. The grounding caused major structural damage to the outer hull from the bow to cargo tank No. 6. The cargo tanks were not breeched, and no LNG was released. The ship was refloated and anchored off the coast of southern Spain, where the LNG cargo was safely transferred to a sister ship, the EL PASO SONATRACH. Subsequently, the EL PASO PAUL KAYSER was towed to Dunkerque, France, and repaired. It is reported that about 800 tons of steel were replaced.

The LNG TAURUS was grounded off Kammon Kaikyo, Tobata, Japan, on December 12, 1980. Its outer hull was severely damaged, causing flooding of most of the ballast tanks. However, no LNG cargo was released. Subsequently, the LNG TAURUS was refloated, and it proceeded to the Kita Kyushu LNG terminal, where the cargo was off-loaded. Afterwards, the ship steamed to a Japanese shipyard and was repaired. The amount of steel replaced is estimated at 2,300 tons.

To reiterate, while both the EL PASO PAUL KAYSER and the LNG TAURUS sustained major structural damage to their outer hulls, no LNG cargo was released in either casualty. This demonstrates the ruggedness of the double-hull construction required for LNG ships.

LNG Tanker Casualties

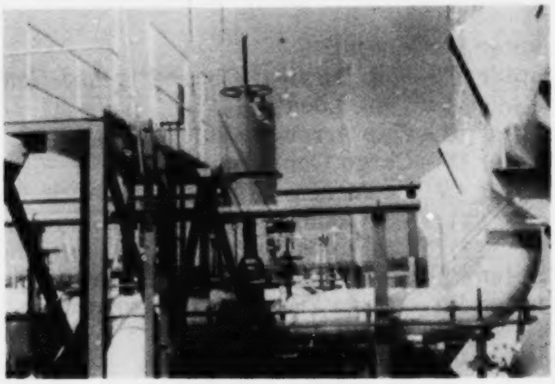
Ship	Accident or Incident
METHANE PROGRESS	Deck cracked by minor LNG spill
DESCARTES	Loss of rudder at sea; towed to port
METHANE PROGRESS	Deck cracked by spill of liquid nitrogen
JULES VERNE	Minor LNG spillage caused by overflowing of tanks
METHANE PROGRESS	Ran aground; damaged rudder
METHANE PRINCESS	Rammed at berth, Canvey Island, England
EUCLIDES	Minor damage as a result of contact with another vessel
EUCLIDES	Ran aground at Le Havre; damaged bottom and propeller
KHANNUR	Collided with cargo ship near Singapore; minor damage
LNG CHALLENGER	Struck by floating crane; minor hull damage
EL PASO PAUL KAYSER	Grounded near Gibraltar; bottom severely damaged; no LNG spill; cargo transferred to EL PASO SONATRACH
LNG LIBRA	Damaged drive system; cargo transferred to LNG LEO
LNG TAURUS	Grounded at Tobata; no LNG spill; vessel refloated and cargo off-loaded at Tobata LNG terminal
EL PASO CONSOLIDATED	LNG leakage from flange; deck cracked
MOSTEFA BEN BOULAID	LNG valve failure; deck cracked
LARBI BEN M'HIDI	LNG vapor released during transfer arm disconnect, exposing terminal employee to frostbite

The BEN FRANKLIN uses a membrane system developed by Technigaz. This "two-tank" system has a stainless steel primary barrier, balsa wood insulation, and a plywood secondary barrier. Three U.S. tankships built by Newport News Shipyard are equipped with this system.

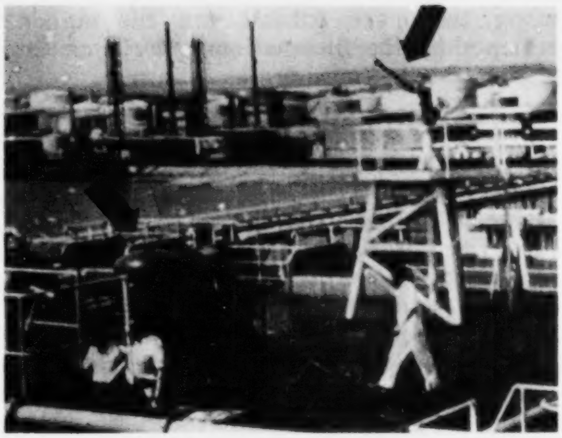
Of the other casualties shown in the table, the valve failure which occurred on the MOSTEFA BEN BOULAID was potentially the most serious. In this casualty, failure of a check valve caused approximately one gallon of LNG to be released. The leak sprayed the nearby deck, causing significant structural cracking in the immediate area. This casualty clearly demonstrates what kind of structural damage LNG can cause if it is permitted to come into contact with materials not capable of withstanding its extremely low temperatures. In this instance, only the excellent response of the crew in activating the emergency-shutdown system and the water-spray system kept the casualty from turning into a major incident.

As in any industry, LNG carriers experience incidents and events which are not considered accidents or marine casualties. Among these are leaking valve seals and gaskets, minor leakages from other cargo valves, and various types of equipment failures. These kinds of incidents sometimes require that operations be temporarily stopped in order to rectify the malfunction. In some instances, even small amounts (several drops) of LNG are released, but such releases are easily controlled by the water-spray systems aboard the ship.

Often in the past, the ignition of LNG vapor at the top of the vent mast has been referred to as an accident. This is an incorrect characterization. What has happened in these incidents is that LNG vapor being released through the vent system has been ignited by lighting—an uncommon, but not unexpected, occurrence. Many shipowners elect to equip their vessels with vent masts designed for such occurrences; such vent masts are fitted with extinguishing (snuffing) devices.



LNG carriers are the only tankships allowed to burn their own cargo as fuel. The vapor that builds up in the tanks would otherwise have to be vented to the atmosphere. Since the vapor is flammable, the Coast Guard has led the way in requiring LNG carriers to consume the vapor when in U.S. waters. The vapor is drawn off, heated so that the pressure builds up, and piped to the boilers. Shown in the picture here is the "remotely operated, quick-closing shut-off valve." LNG ships are required to have such a valve outside the engine room for use in emergency shutdowns.



The arrow in the upper right-hand corner points to a dry chemical firefighting monitor, while the arrow on the left points to the dry chemical storage container. The dry chemical system is intended for use in combating small fires on deck. The arrow on the bottom points to the supply for the water-spray system. Water is kept under pressure on some LNG carriers for two reasons: to disperse flammable vapors until a leak can be stopped and to cool the deck area in the event of a fire. The combination of water spray and dry chemical will serve to control minor fires, but there is no way to extinguish a truly large LNG fire (short of letting it burn itself out). Prevention of such a fire has thus been built into LNG ships in the form of additional safety features (special materials, double hulls, leak containment and detection systems, etc.).

It is also acknowledged that non-cargo-related events occur aboard LNG ships. Examples of these types of events are the various types of machinery malfunction. Such events are not normally considered marine casualties unless they lead to or contribute to a major failure of a ship.

The LNG tanker industry has an excellent safety record. There are many reasons for this; however, much of the enviable record can be attributed to the industry itself. Industry officials have realized from the start that safety must be paramount. Considerable research has been conducted on the hazards associated with LNG. In addition, industry and government cooperation at the national and international level has led to the development of a large body of legislation, standards, and codes which are applicable to LNG ship design and operation. Among the more notable are the standards developed by the International Maritime Organization (IMO). These are as follows:

The IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

The IMO Code for Gas Ships contains detailed standards for the design, construction, and equipment of an LNG ship. To illustrate the breadth of the Code, its Table of Contents is reproduced at the end of this article. Notable among the many requirements is that an LNG ship must be of double-skin construction. This means that the ship has an outer hull, an inner hull, and then the cargo containment system. Double-skin construction is not unique to LNG ships; however, this design is not often used in the oil tanker industry. As was evidenced during the grounding casualties mentioned earlier, double-hull construction provides a high degree of protection for the cargo containment system.

International Convention for the Safety of Life at Sea, 1974 (SOLAS 74) and Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974

SOLAS 74 and its 1978 Protocol contain the basic international standards for shipping safety. SOLAS addresses lifesaving and fire protection (passive and active), as well as navigational safety. As a result of the 1978 SOLAS amendments, there has been a substantial upgrading of the requirements for electronic navigation equipment (collision-avoidance radar is now required on the large ships), design of steering-gear systems, and safety in general. All of the requirements are applicable to LNG tankers.

In the United States, the Coast Guard administers the LNG ship standards. The Coast Guard is recognized as an international leader in LNG ship safety.

Of the Coast Guard's safety programs, two have been especially important in improving the industry's safety record. These are the ship design review and the port control programs. Through these programs, the Coast Guard ensures that all LNG ships (regardless of flag) that operate in U.S. waters do so in compliance with rules and regulations. In addition, the navigation and cargo operations of LNG ships are monitored and controlled during their time in U.S. ports.

Conclusion

The LNG shipping industry has developed an enviable safety record. The industry has willingly cooperated with regulatory bodies at both national and international levels, and stringent (but effective) legislation, standards, and codes have been developed. The safety record of LNG ships should come as no surprise. This is an industry where safety and reliability of service are considered inviolate.

The challenge that lies ahead for the industry is to maintain its excellent safety record.

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IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

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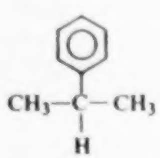
Chemical of the Month

Cumene: $C_6H_5CH(CH_3)_2$

This is the final article in our series of four discussing derivatives of the chemical benzene.

Synonyms:	isopropylbenzene 2-phenylpropane cumol
Physical Properties	
boiling point:	152°C (306°F)
freezing point:	-96°C (-141°F)
vapor pressure at	
20°C (68°F):	8 mm Hg
38°C (100°F):	10 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	50 ppm; 245 mg/m^3
short term exposure limit:	75 ppm; 365 mg/m^3
Flammability Limits in Air	
lower flammability limit:	0.9% by vol.
upper flammability limit:	6.5% by vol.
Combustion Properties	
flash point (o.c.):	25°C (77°F)
flash point (c.c.):	44°C (111°F)
autoignition temperature:	424°C (795°F)
Densities	
liquid (water = 1.0):	0.86
vapor (air = 1.0):	4.14
Identifiers	
U.N. Number:	1918
CHRIS Code:	CUM
Cargo Compatibility Group:	32 (Aromatic Hydrocarbons)

Cumene (CUE-mean) is a clear, colorless liquid that is used largely as a chemical intermediate—a substance formed as a step in the production of another substance. Ninety percent of the cumene produced today is used in the making of the chemicals phenol (the caustic, crystalline alcohol derivative of benzene used in such things as disinfectants and pharmaceuticals) and acetone. The majority of the remainder is used in the production of alphamethylstyrene, an ingredient in resins. Minor amounts are used as a solvent or are added to gasolines to improve octane ratings. In terms of volume produced, cumene ranked 31st among chemicals in 1981, according to the May 3, 1982, issue of *Chemical and Engineering News*. In the most commonly used production process, pure cumene is derived from a benzene-propylene reaction.



Cumene is one of the "aromatic hydrocarbons." As such, it has a distinctive odor. In their vapor form, most hydrocarbons (organic compounds made of carbon and hydrogen) are heavier than air. Cumene, although it produces relatively little vapor, is no exception. This means that its vapor will sink to the ground or deck and, if it comes into contact with a source of ignition, could "flash back" to its source and set the entire container of cumene afire. Effective firefighting agents are water spray, dry chemical, foam, and carbon dioxide. Firefighters should use respiratory protection such as a self-contained breathing apparatus and full protective body clothing.

Cumene can affect the body through skin and eye contact, ingestion (swallowing), and inhalation. The effects of short-term overexposure are irritation of the skin, eyes, and upper respiratory tract. Dizziness, incoordination, drowsiness, and unconsciousness may occur. Long-term skin exposure may cause a skin rash. Cumene can be absorbed through the skin more rapidly than any of the other three chemicals in this series and is considered a primary skin and eye irritant. Cumene has also been shown to be a potent narcotic when inhaled, but this problem is mitigated by the combination of its low vapor pressure and low odor threshold. A substance with a high vapor pressure would rapidly evaporate and saturate the air; cumene, on the other hand, is unlikely to be inhaled in significant amounts because it is very slow to vaporize. The low odor threshold (a mere 1 - 2 parts per million will serve to alert someone of cumene's presence) is well below the exposure limits prescribed by the American Conference of Governmental Industrial Hygienists.

To protect themselves from exposure to liquid cumene, personnel should wear impervious clothing, gloves, and face shields/splashproof safety goggles. Contaminated clothing should be removed and thoroughly washed before being reworn. Affected skin areas should be washed with soap and water. The eyes, if affected, should be flushed with plenty of water. In cases of ingestion, vomiting should not be induced because of the danger of aspiration, which could lead to lung congestion. Inhalation overexposure (which might be a problem in an enclosed space, where the vapor could saturate the air) is treated by removal of the victim to fresh air and, if necessary, artificial respiration.

Cumene is regulated by the U.S. Coast Guard as a Subchapter D commodity, Grade D flammable liquid. The International Maritime Organization (IMO) does not regulate cumene carried in bulk.

Throughout this series of articles, we have attempted to show that several chemicals related to benzene do not exhibit benzene's chronic (long-term) health hazards. To be sure, each of these chemicals has its own hazards, and these hazards are such that if you might be exposed to the chemicals you should treat them with respect. If you recognize and understand the hazards presented by the individual chemicals, you can easily avoid them, generally by simply exercising some common sense. This applies to just about any chemical commodity you would care to name. In other words,

read the Cargo Information Cards

and

don't drink the chemical,
sniff it,
or swim in it.

Hazard Evaluation Branch
Marine Technical and
Hazardous Materials Division

Tank Coatings

Don't Hazard a Guess on Hazards

by LT M. J. Pontiff

LT Pontiff was recently transferred from the Marine Safety Office in Port Arthur, Texas, to the MSO in Hampton Roads, Virginia.

While working at MSO Port Arthur, I learned that several of our Coast Guard Marine Inspectors were concerned about health hazards connected with exposure to certain marine protective tank coatings. Questions about such hazards usually arise during an internal examination of a ballast tank or void on a vessel that has been in service for a while. This is particularly applicable to the inland and offshore tank barges in the Gulf Coast area, where the owners have had the steel bulkheads and bottom plating coated to prevent deterioration. When the vessels are in a shipyard for routine maintenance and dry-docking, the tanks are coated as a rust-prevention measure or recoated after hot work and repairs have been completed. We all know how *messy* it is to examine internally a ballast tank that has been coated with "inspection repellent," but what about toxicity and flammability?

I did a little research by talking to our local paint and coatings vendors and with the local Occupational Health and Safety Administration (OSHA) office. They were more than willing to help me. All of the vendors with whom I spoke provided me with Material Safety Data Sheets on their respective products. I found out that OSHA requires that such a sheet be available for all chemical compounds. I gathered several of these sheets from companies whose products I knew were used in our area. The table accompanying this article is a summary of the data on these sheets. (Of course, this is only a representative sampling.) In general, the health hazards shown are a concern mainly during the application process. However, even after the coating has been applied and cured for the proper period of time, precautions to ensure adequate ventilation and prevent the spread of fire may be indicated. This is especially important when hot work is done on a coated tank *(see this month's Lessons from Casualties section)*.

When an inspector, owner's representative, or shipyard worker is in doubt about the toxicity or flammability of a protective tank coating, he should ask to see the Material Safety Data Sheet. The sheets vary in form but, basically, all have the same information, including trade names and synonyms, manufacturer and phone number, health hazards during application, fire protection information, and any special precautions to be taken.

There is no need to guess what the hazards may be where protective coatings are concerned. Our office policy now requires that, when questions arise, Coast Guard Marine Inspectors consult the Material Safety Data Sheet before entering a coated tank. The vessel's owner may not have the data sheet readily available, but it is easily obtainable from the vendor who supplied the protective coating.

Tank Coatings Safety Data

TRADE NAME	MANUFACTURER	FLASH POINT	EXTINGUISHING MEDIA	HEALTH HAZARD DATA/ ADDITIONAL COMMENTS
1976 Rust Proof Compound L	TEXACO, INC. P.O. Box 509 Beacon, NY 12508 (914) 831-3400, ext. 406	125°F Combustible	Water spray, DC (dry chemical), foam, CO_2	Minimally irritating. Use with adequate ventilation. Avoid prolonged breathing of vapor or mist. Avoid prolonged contact with skin. Not recommended for coating the interior of potable-water tanks. Exposed employees should maintain reasonable standards of personal cleanliness. Protective goggles or face shield may be worn during appliation.
1977 Rust Proof Compound H	TEXACO, INC. (as above)	425°F	Water spray, DC, CO_2 (Caution: water or foam may cause frothing)	Minimally irritating. Not recommended for coating the interior of potable-water tanks.
1995 Floatcoat	TEXACO, INC. (as above)	325°F	same as preceding item	Minimally irritating.
Magnakote	MAGNUS MARITEC INTERNATIONAL, INC. Osborn Building St. Paul, MN 55102 (612) 293-2233	325°F	Water spray, DC, foam, CO_2. Use air-supplied rescue equipment for enclosed areas.	Mild skin irritation after prolonged skin contact. Avoid prolonged breathing of vapors. Do not store or mix with strong oxidants. Store and use away from heat, sparks, and open flames.
Bio-Kote	ESGARD, INC. P.O. Drawer 2698 Lafayette, LA 70502 (318) 234-6327	450°F	CO_2, DC	None
Bio-Gel	ESGARD, INC. (as above)	450°F	CO_2, DC	None
Interfilm Type II	ESGARD, INC. (as above)	100°F	CO_2, DC, water fog. A straight water stream will spread fire.	Use with adequate ventilation. Avoid heat, sparks, and open flames. Use a positive-pressure mask in enclosed areas during application.
Bar-Rust	DEVOE MARINE COATINGS CO. 1616 W. Loop So. Suite 301 Houston, TX 77027 (713) 626-3971	None	None	Nontoxic. Do not store under freezing conditions or apply below 45°F.
Bar-Rust 235	DEVOE MARINE COATINGS CO. (as above)	101°F	CO_2, DC	Use with adequate ventilation. Keep away from excessive heat and open flame. Applicators should be provided with suitable protective gear in accordance with U.S. Dept. of Labor's Safety and Health Regulations for Ship Repairing.

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. You are using an oxygen indicator to determine whether it is safe to enter a tank. The minimum percentage of oxygen that will sustain life is

A. 8%.
B. 11%.
C. 16%.
D. 21%.

REFERENCE: MTAB Firefighting Manual

2. In waters where the cardinal system of buoyage is used, you would expect to find the danger

A. lying to the south of an eastern quadrant buoy.
B. lying to the south of a northern quadrant buoy.
C. lying to the east of an eastern quadrant buoy.
D. beneath or obviously directly adjacent to the buoy.

REFERENCE: Bowditch

3. The Flinders bar is installed to compensate for

A. induced magnetism in vertical soft iron.
B. induced magnetism in horizontal soft iron.
C. permanent magnetism in horizontal soft iron.
D. residual magnetism.

REFERENCE: Bowditch

4. When a block and tackle is "rove to advantage," this means that the

A. blocks have been overhauled.
B. hauling parts of two tackles are attached.
C. hauling part leads through the movable block.
D. hauling part leads through the standing block.

REFERENCE: Merchant Marine Officers Handbook

5. The celestial coordinate of a star that is relatively constant in value is the

A. Greenwich Hour Angle.
B. local hour angle.
C. sidereal hour angle.
D. meridian angle.

REFERENCE: Bowditch

ENGINEER

1. What is the advantage of a flash-type evaporator compared to the submerged-tube type?

A. High operating temperatures prevent a loss of vacuum.
B. Chemical feed is required only every 10 days (at a steady rate).
C. The requirement for a three-way dump valve is eliminated.
D. Low operating temperatures decrease scale formation.

REFERENCE: Harrington

2. In the event of a power failure to the salinity panel on a flash-type evaporator, the three-way solenoid valve will

A. be frozen in its last position.
B. direct distillate to the fresh-water tank.
C. dump distillate to the bilge.
D. dump distillate to the make-up feed tank.

REFERENCE: NAVPERS Engineman 3 & 2

3. If sea-feed temperature in a flash evaporator falls below 160°F,

A. distillate will be directed to the contaminated drain tank.
B. the automatic solenoid valve will direct distillate to the bilge.
C. the demesters will become scaled.
D. priming will occur in the first effect.

REFERENCE: Harrington

4. In a flash-type evaporator, heated water under pressure is converted into vapor by a sudden

A. decrease in density.
B. decrease in pressure.
C. increase in velocity.
D. increase in temperature.

REFERENCE: Harrington

5. The process of boiling sea water in order to separate it into fresh-water vapor and brine is usually defined as

A. evaporation.
B. condensation.
C. dehydration.
D. osmosis.

REFERENCE: Principles of Naval Engineering

ANSWERS

DECK
1.C;2.B;3.A;4.C;5.C
ENGINEER
1.D;2.C;3.B;4.B;5.A

Lessons from Casualties

Tank Preservative Catches on Fire

by LT Ruben H. Arredondo
Marine Safety Office
Port Arthur, Texas

On February 20, 1982, a large flash fire occurred in the No. 3 port ballast tank of a Liberian-flag tanker while the vessel was moored in Port Neches, Texas. Several men were inside the tank conducting repairs on a side frame and cutting with a torch on the upper portion of the tank. Suddenly a large flash fire started in the lower portion of the tank and spread through the port bulkhead. The fire lasted only several minutes and self-extinguished. The repairmen escaped without any injuries.

The incident was reconstructed as follows: while the side frame was being trimmed, a piece of hot slag landed on a sidelong which contained residue of tank corrosion preservative ("Corrosion Master," white). The hot slag caused the residue to ignite and create the flash fire. Contributing to the casualty was the failure of the repairmen to place a fire shield underneath the repair area to prevent the hot slag from landing on the preservative.

A "gas-free" certificate for the tank had been issued the morning of the casualty, as the tank had been found to be gas-free. The marine chemist stated that he issued the certificate based on his findings that the oxygen content and the explosion level were "safe for hot work." Also, he and an owner's representative had tested the tank preservative previously and found it to have an extremely high flash point and be self-extinguishable. The following day the tank was re-examined and still found to be gas-free. There was no structural damage noted in the tank. The only damage was localized charring of the tank coating.

LESSONS LEARNED:

1. Even though most tank preservatives have an extremely high flash point, care must be taken when conducting hot work around them.
2. Flash fires from tank preservatives may be prevented by either completely cleaning the preservative underneath the repair area or placing a fire shield of noncombustible material directly underneath the repair area.
3. These precautionary measures can prevent serious injuries.

DATA ON "CORROSION MASTER" (WHITE)

Manufacturer:	Clearkin Chemical Corp. P.O. Box 14817 Philadelphia, PA 19134 (215) 426-7230
Flash Point:	375°F
Extinguishing Media:	CO_2 or dry chemical
Health Hazard:	None. It is nontoxic, non-irritating, and does not contain solvents.
Additional comments:	Product is self-extinguishable. It is recommended that a fire shield be used during hot work. ⍊

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of Transportation

**United States
Coast Guard**

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of the Marine Safety Council

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Commandant

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When you have finished reading this issue, please pass it on.

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cover

This month marks the 30th anniversary of the death of Sinbad, mascot of the U.S. Coast Guard Cutter CAMPBELL. Here, CDR Gilbert Lynch reads the little dog his retirement orders at ceremonies held aboard the CAMPBELL September 21, 1948. "Sinbad of the Coast Guard" begins on page 329.

The Marine Safety Council and its staff would like to wish you and your family a happy and safe holiday season. We would also like to take this opportunity to introduce ourselves and to familiarize you with the functions of the Marine Safety Council staff so that we may better serve you.

Captain Christopher M. Holland, Executive Secretary, is our office chief. As Executive Secretary, he has oversight responsibility* for the Coast Guard regulatory system and ongoing regulatory projects. Any comments or concerns dealing with Coast Guard regulatory actions should be directed to him. Captain Holland also serves as Executive Secretary for the Towing Safety Advisory Committee and the Chemical Transportation Advisory Committee and oversees the administration of these committees.

Bruce P. Novak is Deputy Executive Secretary and acts for the Executive Secretary in his absence.

Lieutenant (j.g.) David R. Schoorens, Regulations Coordinator, maintains all files relating to Coast Guard regulations. Any questions dealing with the status of regulations or the availability of information on Coast Guard regulations should be directed to him.

Ensign Frederick Kenney is our Publications Officer and Committee Officer. Questions concerning Coast Guard marine safety publications, the Code of Federal Regulations, or the FEDERAL REGISTER should be directed to him. Inquiries about the activities or records of the Towing Safety Advisory Committee or the Chemical Transportation Advisory Committee should also be directed to him.

Chief Petty Officer John E. Forbes takes care of administrative matters for the office and helps the Regulations Coordinator and Publications Officer answer requests from the public.

Geraldine Brown is secretary to the Executive Secretary.

Mary Abraham, our clerk/typist, maintains and updates the mailing list for the *Proceedings of the Marine Safety Council.* She also handles requests for reprints of the daily FEDERAL REGISTER.

Julie Strickler is editor of the magazine you are reading. Questions and comments about the magazine or submissions should be directed to her.

The office of the Marine Safety Council staff is located in room 4402 at Coast Guard Headquarters (2100 Second Street SW, Washington, DC). Our telephone number is (202) 426-1477. Correspondence should be directed to:

Commandant (G-CMC)
U.S. Coast Guard
Washington, DC 20593

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* This means he is responsible for all oversights—Ed.

Maritime Sidelights

Comprehensive List of NVCs to Be Printed

An update on Navigation and Vessel Inspection Circulars was printed in the July 1982 issue of the *Proceedings*, and a comprehensive list was promised for the December 1982 issue. The officials responsible for the NVCs have since decided that a separately printed comprehensive list would better serve the needs of the maritime community.

The new list, "O-83," will be published in January 1983 and mailed to all NVC subscribers. It will also be available from local OCMIs (Officers in Charge of Marine Inspection) or from Commandant (G-MP-4/14), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-2163.

A July update of the NVC list will continue to appear in the *Proceedings.*

Coast Guard Looking for Engineers and Naval Architects

The Coast Guard is interested in filling several engineering and naval architect positions in its Marine Technical and Hazardous Materials Division (Office of Merchant Marine Safety). Responsibilities include vessel plan review, research administration, policymaking, and interaction with other government agencies and other national administrations. The salary for these positions ranges from $16,000 (GS 7) to $45,000 (GS 13), depending on the applicant's experience.

Interested persons should fill out an SF-171, the standard application form for employment with the Federal government. Such forms are available from any government agency. The completed SF-171 should be submitted to:

Civilian Personnel Branch
(C-CAS-5)
U.S. Coast Guard
Washington, DC 20593
Tel.: (202) 426-2330

TSAC Appoints New Members

Secretary of Transportation Drew Lewis has anounced the appointment of nine members to the Towing Safety Advisory Committee (TSAC).

TSAC advises the Secretary on matters concerning shallow-draft inland and coastal waterway navigation and towing safety. The members of the committee represent various interested parties and geographical areas. The new members began serving on the committee at the TSAC meeting held October 6 - 7, 1982.

The new appointments are: William Creelman, President, National Marine Service, Inc., St. Louis, Missouri, David S. Field, Lake Providence Marine Terminal Co., Lake Providence, Louisiana, Paul Giordano, P & F Giordano Market, Philadelphia, Pennsylvania, Captain John G. Graham, General Manager, Gulfcoast Transit Company, Tampa, Florida, Charles F. Lehman, Vice President, American Commercial Barge Line, Jeffersonville, Indiana (reappointment), Austin P. Olney, Lebouef, Lamb, Leiby and MacRae, Washington, DC, Robert W. Sanders, President, Turecamo Coastal & Harbor Towing Corp., New York, New York, Steven Scalzo, Vice President, Foss Launch and Tug Co., Seattle, Washington (reappointment), and Captain William F. Tuttle, Local 333, United Marine Division, New York, New York.

HHS Declares Grace Period for Medicare Sign-up

The Department of Health and Human Services has announced that merchant seamen eligible for Medicare who have not enrolled in Medicare Part B medical insurance may sign up without having to pay a surcharge for late enrollment during a grace period ending December 31, 1982.

Until last year, merchant seamen who became eligible for Medicare by reason of age, disability, or kidney failure could still receive their health care through U.S. Public Health Service hospitals. In March 1981 the department announced that, effective the following October, PHS hospitals would be transferred to communities. Most Medicare-eligible seamen subsequently signed up for Part B insurance. Some, however, chose not to enroll in Part B, which requires the beneficiary to pay a monthly premium as well as a premium surcharge for late enrollment.

Under a new law, merchant seamen may now enroll in Part B without having to pay a surcharge if they do so before December 31 of this year. The surcharge will be imposed on enrollments after that date. The new law also provides that, during the same period, seamen may pick up Part A hospital insurance according to regular Social Security provisions. In addition, merchant seamen who enrolled in Medicare after March 1981 at a higher premium rate can, under the new law, have their premium rolled back to the standard rate.

Full details on the provisions of the new law are available from local Social Security offices.

MarAd Releases Report on Alaskan Gas Option

The Maritime Administration has released a technical report on the potential development and use of Alaskan natural gas. The study concludes that gas produced in the Prudhoe Bay area, currently the major source of the state's oil, could be piped to South Alaska, liquefied, and moved to potential markets by ship at costs that would be competitive with those of pipeline systems.

The two-volume report, "Alaska Natural Gas Development: An Economic Assessment of Marine Systems," analyzes and combines information on Alaskan gas supplies, processing and transportation options, and markets for gas-based fuels and fertilizers. It was prepared under contract by ICF Inc., of Washington, DC.

ICF found that, although major resource deposits are anticipated throughout Alaska, only Prudhoe Bay gas could provide significant new gas supplies during the next decade. It also noted that Alaska North Slope gas lends itself more to liquefied natural gas (LNG) than to methanol.

ICF concludes in its report

that the most economically attractive system for developing Prudhoe Bay natural gas would be to pipe it to South Alaska, liquefy it at barge-mounted plants, and ship it as LNG to Japan. Further, if development options are limited to supplying the lower 48 states, which is not the case under current law, then a marine LNG system would be economically competitive with other pipeline systems.

Copies of the report are available from the National Technical Information Service (NTIS), Springfield, Virginia 22161. Ordering information is as follows:

Volume I, Final Report: PB82-260399, $9.00.

Volume II, Appendix: PB82-260407, $18.00.

New Courier Service Introduced

A new worldwide courier service to ships has been inaugurated by World Courier, Inc., to serve the special needs of the maritime industry.

Literature is available detailing the service, which provides for the delivery of documents, parts, or equipment from any major city in the world to ships in port or at major sea route points, including Panama, Singapore, Suez, Malta, and Capetown. James R. Berger, World Courier President, said that the desk-to-ship service is particularly critical when electronic parts, sea-safety equipment, clearance documents, or manifests are involved.

The new service, he added, is designed to appeal to a broad range of marine interests such as suppliers, charter brokers, electronic equipment manufacturers, agents, and shipping companies.

Details are available from World Courier, Inc., 19 Rector Street, New York, New York; tel.: (212) 267-1770.

(Reprinted from the September 1, 1982, issue of Maritime Reporter and Engineering News)

Ship-to-Shore Satellite Data Link Successfully Demonstrated

Research co-sponsored by the Maritime Administration and the Council of American-flag Steamship Operators (CASO) has led to a major breakthrough in the medium-to-high-speed transmission of digital data to and from ships using commercial satellite voice channels and comercially available hardware and software.

The key feature in the experiment, successfully demonstrated in August, was an unusual technique adapted from microwave radio technology by Maritel Technology, Inc., under subcontract to Arinc Research Corp. of Annapolis, Maryland. It uses compatible two-wire and four-wire Racal/Vadic modems, thereby surmounting one of the common problems in connecting the two-wire public-switched network with the four-wire satellite link. The compatible off-the-shelf modems, together with a full duplex feature operating on a split channel, avoid echo and other technical problems normally encountered in such data communications.

The communications software used is Digital Equipment Corp.'s Decnet-Rt, version 1.1, outfitted with a high-level data link control called DDCMP. It provides end-to-end assurance, accounting control, password security, limited recovery, and diagnostic capability as well as some performance-monitoring features.

In the August demonstration, data were transmitted at 1,200 bits per second from a simulated shipboard minicomputer to a shoreside minicomputer using the INMARSAT MARECS-A satellite and dial telephone lines.

Plans are now being made to test the system in actual marine operations.

MMA CAMS Announces Courses for 1983

The Maine Maritime Academy Center for Advanced Maritime Studies has announced the following courses for 1983:

Petroleum Tanker Safety Course, commencing the weeks of March 7, May 16, August 1, and October 10;

Inert Gas Systems/Crude Oil Washing, commencing the weeks of March 14, May 23, August 8, and October 17;

Chemical Tanker Safety Course, commencing the week of August 15; and

Ship's Medicine Course, January 10 - 14, March 21 - 25, May 9 - 13, July 25 - 29, September 12 - 16, and November 14 - 18.

For further details and registration information, contact Mrs. Doris Richardson, CAMS Registrar, Maine Maritime Academy, Castine, Maine 04421; tel.: (207) 326-4311, ext. 210 or 211. ⚓

Training Facilities

with Coast Guard-approved Radar Observer Courses

On November 15, 1982, the final rule regarding "Radar Observer Endorsement--Demonstration of Skills," Parts 10 and 157 of Title 46 of the Code of Federal Regulations, went into effect. Deck officers will henceforth be required to demonstrate important skills, such as radar operation and interpretation, rather than simply prove their knowledge in a written test.

Each applicant for a radar observer endorsement or for renewal of an endorsement must complete an approved course for the endorsement desired and receive the appropriate certificate of training from a radar training facility. The only exceptions to this rule are persons currently possessing radar observer endorsements who reside in remote locations. They may renew their endorsements through a written examination administered by the Regional Examination Center.

There are presently 15 training facilities with Coast Guard-approved radar observer courses. The Coast Guard recommends that individuals interested in attending a course at one of these facilities contact the facility for information on course availability and duration and to ensure that the program offered fulfills the requirements for the Radar Observer endorsement desired. A list of approved schools and specific courses can be obtained by writing Commandant (G-MVP-3/14), U.S. Coast Guard, Washington, DC 20593 or calling (202) 426-2240. At present, the following schools are on the list:

Seaman's Church Institute—Merchant Marine School
Radar School
15 State Street
New York, NY 10004
(212) 269-2710

State University of New York Maritime College
Ft. Schuyler, Bronx, NY 10465
(212) 892-3000

U.S. Merchant Marine Academy
Kings Point, NY 11024
(516) 482-8200

M.M.&P. Maritime Advancement Training, Education, and Safety Program
(Radar School)
2228 Elliott Avenue
Seattle, WA 98121
(206) 628-0419

Delgado Community College Radar School
6th Floor, Unit 1, Section A
4400 Dauphine Street
New Orleans, LA 70146
(504) 568-6246

MEBA D#2-AMO Great Lakes Radar School
933-35 Summit Street
Toledo, OH 43604
(419) 255-3940

Great Lakes Maritime Academy
Northwestern Michigan College
Traverse City, MI 49684
(616) 946-5650

Texas Maritime Academy
Galveston, TX 77550
(713) 766-3265

U.S. Army Transportation School
Ft. Eustis, VA 23604
(for Government personnel only;
no telephone number available)

California Maritime Academy
P.O. Box 1392
Vallejo, CA 94590
(707) 644-5601

California Maritime Academy Radar School
Pier 1, Bldg. 317
Ft. Mason, San Francisco, CA 94111
(707) 644-5601

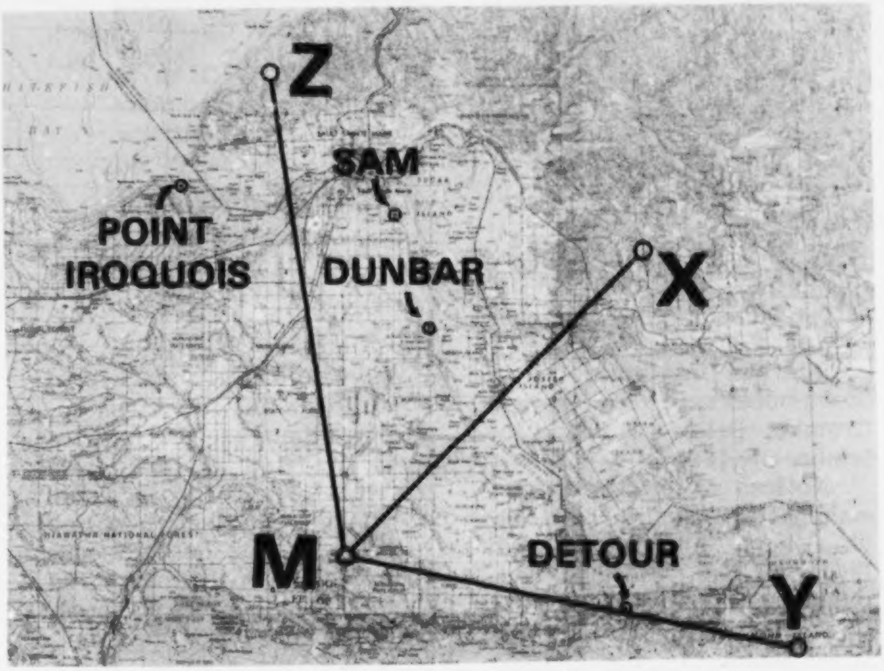
Maine Maritime Academy
Castine, ME 04421
(207) 326-4311

Marine Safety International
Marine Air Terminal
LaGuardia Airport
New York, NY 11371
(212) 565-4125

Maritime Institute of Technology and
Graduate Studies
5700 Hammonds Ferry Road
Linthicum Heights, MD 21090
(301) 859-5700

Massachusetts Maritime Academy
Buzzards Bay, MA 02532
(617) 759-5761

St. Marys River "Mini-Chain" Project is Wrapped Up



Monitor sites within the St. Marys River mini-chain are shown on this map as circles with dots (the clear circles are the mini-chain transmitters).

In 1976, an experimental "mini-Loran-C chain" was installed to cover the Saint Marys River in Upper Michigan. This location was selected as a test bed because of considerable local demand for an aid in transiting the particularly narrow channels there under all weather conditions. The goal of the mini-chain project was to demonstrate the value of precision Loran-C for commercial ships transiting the river.

The mini-chain project has been summarized in a final report just released by the Coast Guard's Office of Research and Development. The report reviews the highlights of the 5-year effort to provide all-weather navigation for the region between Whitefish Bay in Lake Superior and DeTour Passage in Lake Huron. The development of precision guidance equipment and Loran-C survey techniques is described.

The results indicate that if relatively infrequent error corrections are made, position information accurate to within 20 meters can be obtained. No special communications link is needed. The study clearly has demonstrated that the mini-chain concept is indeed effective for passage through areas requiring precise navigation.

Copies of the report, "St. Marys River Loran-C Mini-Chain," can be obtained from the National Technical Information Service (NTIS), Springfield, Virginia 22161, by specifying the following information: Report No. CG-D-11-82, Accession No. PB82 255-183.

The following items of general interest were published in the FEDERAL REGISTER between September 23, 1982, and October 18, 1982:

Final rules: CGD 08-82-10 Safety Zone, Calcasieu Channel, Louisiana, September 23, 1982. CGD 03-82-27 Special Local Regulation, Head of the Connecticut River Regatta in Middletown, Connecticut, October 7, 1982. CGD 82-013 Drawbridge Operation Regulations; West Bay, Osterville, Massachusetts, October 7, 1982. CGD 82-024 Drawbridge Operation Regulations; Lagoon Pond, Martha's Vineyard, Massachusetts, October 7, 1982. CGD 82-091 Special Anchorage Areas, October 14, 1982. CGD 82-034 Joint U.S. Coast Guard and National Transportation Safety Board Regulations for Marine Casualty Investigation, October 14, 1982.

Interim final rule: CGD 03-80-03(A) Anchorage Grounds, Delaware Bay, September 27, 1982.

Notices of proposed rulemaking (NPRMs): CGD 07-82-02 Special Anchorage Area, Biscayne Bay, Florida, September 27, 1982. CGD 80-024 Lifesaving Equipment for the Great Lakes, October 4, 1982. CGD 10-82-09 Drawbridge Operation Regulations; South Fork of Willapa River, Washington, October 7, 1982. CGD 08-82-018 Mantua Creek, New Jersey, October 7, 1982.

Notices: CGD 82-093 U.S. Coast Guard Academy Advisory Committee, Notice of Meeting, October 4, 1982. CGD 82-094 Towing Safety Advisory Committee, Notice of Meeting, October 4, 1982. CGD 82-095 Houston/Galveston Navigation Safety Advisory Committee, Notice of Meeting, October 7, 1982. CGD 82-097 National Boating Safety Advisory Council, Notice of Meeting, October 14, 1982. CGD 82-071 Port Access Route Study, Notice of Study Results, October 14, 1982. CGD 82-098 Committee on Maritime Hazardous Materials, Notice of Meeting, October 18, 1982.

Questions concerning regulatory dockets should be directed to Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593; tel.: (202) 426-1477.

* * *

Required Tests and Inspections for Thermal Fluid Heaters (CGD 80-064)

On October 18, 1982, the Coast Guard published a proposal to modify the rules regarding the required inspections of fired thermal fluid heaters. This proposal would bring the inspections into line with this type of heater's construction and operation. Fired thermal fluid heaters are presently inspected as if they were boilers. This proposal would define fired thermal fluid heaters as a new and separate machinery category. While the construction of boilers and the heaters is similar, their operation is not. CGD 80-064 would minimize hydrostatic and mechanical material tests and require operational safety and control tests. The revised standards should result in a savings of time and money for industry and improve the quality of inspections.

For further information, contact CDR David Strasser, U.S. Coast Guard (G-MVI), Washington, DC 20593; tel.: (202) 426-2190.

General Bridge Permits (CGD 81-057)

The Coast Guard has proposed that a new program for the issuance of General Bridge Permits be established. Permits for the construction, reconstruction, or modification of bridges are now issued on an individual basis after a detailed review of the bridge's impact on navigation and the environment. The proposed new rules would allow bridges having common characteristics to be evaluated as a group. Authorization to proceed with construction under the General Bridge Permit would be granted if a bridge met the criteria of a General Bridge Permit. This would in many instances eliminate significant delay, thereby reducing costs for the public and the government. A notice of the proposal was published on September 20, 1982.

For further information, contact Jerome D. Schwartz, U.S. Coast Guard (G-NBR), Washington, DC 20593; tel. (202) 755-7620. Comments should be mailed to Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593.

Electrical and Fuel System Standards (CGD 81-092)

The Coast Guard has proposed that miscellaneous sections of the Electrical and Fuel Systems Standards found in Subparts I and J of Part 187 of Title 46 of the Code of Federal Regulations be amended. The sections to be amended, which apply to boats having gasoline-powered engines for propulsion or the generation of electricity, are detailed in a notice published in the FEDERAL REGISTER on September 20, 1982. The proposal would make the regulations clearer, easier to comply with, and more cost-beneficial. Unnecessary provisions would be eliminated.

For further information, contact Alston Colihan, U.S. Coast Guard (B-BBS), Washington, DC; tel.: (202) 426-4027.

Visual Distress Signal Equipment Requirements (CGD 82-073)

In a notice published in the FEDERAL REGISTER on September 22, 1982, the Coast Guard proposed that the regulations governing the carriage of visual disgress signals be rewritten to define more clearly where (on what bodies of water) the signals are required. There appears to be some confusion surrounding this question.

For further information, contact William Sobeck, U.S. Coast Guard (G-BBS), Washington, DC 20593; tel.: (202) 426-1080.

Documentation of Vessels (CGD 82-085)

The Coast Guard published a final rule on documentation of vessels on June 24, 1982. In the rule, it identified a potential problem area: the question of how to determine whether or not a vessel had been built in the United States. On October 14, 1982, the Coast Guard published an advance notice of proposed rulemaking (ANPRM) explaining this problem and asking for comments from the public. The Coast Guard is interested in suggestions and comments on the following:

- Is there a need for clarifying amendments to the recently published Part 67.09-3 of Title 46 of the Code of Federal Regulations? If so, what form should the amendments take?
- Is the "fifty (50) percent of cost" rule contained in 46 CFR 67.09-3(c) a valid basis for evaluating whether a vessel should be considered "built in the United States"?
- Should definitions of the terms "components" and "procured" be added to the regulations? If so, what are suggested definitions?
- Are there any industry standards which the Coast Guard should adopt or use to help determine whether a vessel should be considered "built in the United States"?
- What evidence should Coast Guard documentation officers accept when deciding whether something was "procured in the United States"?

Comments or questions should be directed to Phyllis D. Carnilla or LT Robert Meeks, U.S. Coast Guard (G-MVD-1), Washington, DC 20593; tel.: (202) 426-1492.

Optional Table Amended

On October 2, 1982, the Department of Transportation's Research and Special Programs Administration published a final rule updating the Optional Hazardous Materials Table (Optional Table) which appears in Part 172.102 of Title 49 of the Code of Federal Regulations. The purpose of the Optional Table is to enable shippers to be in compliance with both Department of Transportation and International Maritime Organization regulations when describing, classifying, labeling, and stowing hazardous materials on a vessel. The final rule contains changes made in IMO's International Maritime Dangerous Goods Code.

For further information on this final rule, contact E. A. Altemos, Office of Hazardous Materials Regulation, U.S. Department of Transportation, 400 Seventh Street SW, Washington, DC 20590; tel.: (202) 426-0656.

Actions of the Marine Safety Council

The Council approved the following work plans at its October meeting:

CGD 78-035 MARPOL 73/78 Waste Reception Facilities

This regulatory project is directed at U.S. implementation of requirements set forth in the International Convention for the Prevention of Pollution from Ships, 1973 and the Protocol of 1978 (known collectively as MARPOL 73/78). The United States will meet these requirements, which are aimed at reducing open ocean discharge of pollutants, by ensuring that shoreside facilities are provided for disposal of pollutants retained aboard seagoing vessels. The regulations, which are mandated by the Act to Prevent Pollution from Ships, 1980, will cover the criteria the facilities will have to meet and the administrative procedures for issuing a Certificate of Adequacy.

MARPOL has been ratified and will go into effect on October 1, 1983. The U.S. must implement its provisions before October 1, 1984.

An ANPRM is scheduled for January 1983.

CGD 77-069 Construction and Equipment for Existing Self-Propelled Vessels Carrying Bulk Liquefied Gases

Self-propelled vessels authorized to carry bulk liquefied gases in U.S. waters constructed before October 1976 were designed and built in accordance with the applicable U.S. Coast Guard standards in effect at the time of their construction. IMO, the International Maritime Organization, designates such vessels "existing ships." The IMO "Code for Existing Ships Carrying Liquefied Gases in Bulk," an international standard developed with U.S. cooperation, establishes baseline criteria for these vessels and includes requirements which, in certain areas, exceed the current U.S. standards. Adoption of the international requirements would do the following:

- upgrade U.S. regulations in certain areas to achieve consistency with the baseline international criteria,
- increase the international mobility of U.S.-flag vessels because they would be able to obtain IMO Certificates of Fitness, and
- reduce the Coast Guard work load, since, if it accepts the IMO certificate, the Coast Guard would not have to perform as many individual plan reviews.

This proposal would directly affect 16 U.S. vessels, 13 of which are already largely in compliance, and 150 foreign vessels. The U.S. is not alone in planning to impose these requirements. Nine foreign countries have adopted the IMO requirements, and any vessels trading in these countries must comply whether or not the U.S. adopts the standards.

An NPRM is scheduled for this month .

CGD 82-092 Nautical Schools: Implementing the Maritime Education and Training Act, 1980

The Maritime Education and Training Act, 1980 (META 1980), which became effective October 1, 1981, consolidated the authority of the Coast Guard to issue regulations governing vessels operated by public and private nautical schools. (Such authority was previously spread among various statutes.) The Act also brought under Coast Guard inspection jurisdiction some vessels which were not previously inspected. The impact of CGD 82-092 is limited to about 15 vessels, only 1 of which would be newly inspected. No controversy is expected. For the most part, inspection requirements would be unchanged.

An NPRM is scheduled for March 1983.

Please enclose your mailing label when sending in a change of address. Allow eight weeks for change to take effect.

The Council also voted to approve a "continuing docket":

Subchapter "O" Chemical Lists and Compatibility Chart

The intent of this proposal is to allow the Office of Merchant Marine Safety (G-M) to issue changes to the chemical lists and compatibility chart in Subchapter O of Title 46 of the Code of Federal Regulations. Approximately 40 to 60 new chemicals are added to the lists each year. The proposal would grant G-M a "continuing docket," or blanket work plan exemption, so that notices could be processed without referral to the Marine Safety Council. This procedure would relieve the project managers from the burden of preparing repetitive and lengthy work plans.

Most changes to the chart are not controversial. The decisions about compatibility are made on the basis of compatibility testing, and there are no policy issues. In order to safeguard the system, though, G-M would first issue all proposed changes as NPRMs, so that any adverse public reaction could be brought to the attention of the Council and the Commandant by G-M or the Executive Secretary. ⚓

Emergency Care for Hypothermia

by Richard C. Hiscock

Hypothermia—lower than normal core body temperature--is a life-threatening medical emergency. Anyone who has been immersed in cold water, even for a brief time, and anyone rescued from a life raft should be considered a probable hypothermia victim.

The first consideration in dealing with a hypothermia victim is to rescue the victim as gently as possible. Rough handling of victims of hypothermia can aggravate their condition. It may be necessary to put a rescuer into the water--wearing a survival suit and tending line, please!—to assist the victim.

Once the victim is out of the water, treatment will depend on both the condition of the survivor and the facilities available. Generally speaking, survivors who are rational and capable of recounting their experience, although shivering dramatically, merely require the removal of all wet clothes, replacement with dry clothes or blankets, and rest in a warm environment. If a victim can manage his airway (that is, if he is conscious and capable of keeping his throat clear), he may be given warm, sweet liquids, preferably not coffee or tea and definitely **not alcohol.** These survivors will generally rewarm themselves.

In more serious cases, where the victim is semiconscious, unconscious, or apparently dead, you should immediately contact the nearest Coast Guard unit to arrange for prompt medical evacuation. While awaiting further medical instructions and evacuation, you should administer the following first-aid care:

1. After removing the victim from the cold and gently transferring him to a warm environment (being sure to avoid rough handling, as this can cause further harm), check **A**irway, **B**reathing, and **C**irculation. If, after **careful** examination of the victim, you determine that there is no breathing and no heartbeat, immediately begin CPR (cardiopulmonary resuscitation).

2. Remove wet clothes, keeping movement of victim's body to a minimum; cut the clothes away with scissors or knife, if necessary. Do not massage victim.

3. Lay the unconscious or semiconscious victim in a level, face-up position. If vomiting occurs, turn the victim's head to one side. Be sure to check the victim's breathing and heartbeat frequently. You must be prepared to begin CPR if breathing and heartbeat stop.

4. Insulate the victim from further heat loss by wrapping him in blankets. Do not attempt to aggressively rewarm the unconscious victim. Severe hypothermia is a true medical emergency, but rewarming a victim can lead to complications. Definitive rewarming should be accomplished in a hospital. Your main goal in providing first aid is to prevent the victim from getting colder.

5. If there will be a long delay in getting the victim to a hospital, gentle rewarming techniques may be used:

    - apply heating pads or hot water bottles under the blankets to the victim's head, neck, chest, and groin. Keep the victim wrapped in blankets.

    - apply your own body warmth by direct body-to-body contact with the victim. Blankets should be wrapped around you and the victim to conserve the heat you are supplying.

Richard C. Hiscock is a consultant on fishing vessel safety and emergency rescue/survival equipment. This article is reprinted from the August 1982 issue of his Safety Notes for Fishermen.

6. Prepare the victim for evacuation: wrap securely in several blankets, cover with two large plastic bags (one pulled up over the legs and one pulled down from the top with a hole for the head—tape securely at the waist), cover the head with blanket or heavy wool cap.

To Sum Up

RESUSCITATE	- If victim is not breathing, begin mouth-to-mouth ventilations. If victim has no pulse, begin cardiac compression.
INSULATE	- To prevent further heat loss
EVACUATE	- To medical facility as soon as possible
REMEMBER	- "No one is dead until he is warm and dead." Victims have successfully recovered after reaching core temperatures as low as 64°F.

Near Drowning

If, in addition to being cold, the victim has had his face under water, you should immediately begin CPR. Don't stop. Insulate to prevent further cooling. Do not rewarm. Transport ASAP. Don't give up! ⚓

"Unsafe act:

(ŭn' sāf' ăkt) n. 1. A departure from an accepted, normal, or correct procedure or practice which has in the past actually produced injury or property damage or has the potential for producing such loss in the future. 2. An unnecessary exposure to a hazard. 3. Conduct reducing the degree of safety normally present."

Not every unsafe act produces an injury or loss, but, by definition, all unsafe acts have the potential for producing future accident injuries or losses. An unsafe act may be an act of commission (doing something which is unsafe) or an act of omission (failing to do something that should have been done).

By cracking down on acts like the following, you can make this month Unsafe Act Crackdown Month:

- jumping over the ship's rail to get ashore. (Use the gangway or accommodation ladder.)
- stepping over the ship's mooring wires. (Go around and up the catwalk.)
- working aloft or over the ship's rail without a safety harness.
- going on deck without the proper safety apparel.

These are just a few unsafe acts that could cause injury. Now let us look at another unsafe act. This act is never intentional (at least we hope it isn't) but rather the result of a mistake or lack of knowledge. We are talking about the occasional opening of a wrong cargo valve on a tank and the failure to report that act to a superior.

The original error—the opening of the wrong valve--is usually an honest and human one and, if reported at once, can usually be corrected with minimal cost. But the second one--the attempt to cover up the mistake by not reporting it--always leads to much more serious consequences. A major contamination follows, and high-cost penalties are incurred.

So, when you're handling cargo, stay alert and be sure you're working the right valve. But if you make that simple, honest mistake and move the wrong one, tell the senior cargo handler and shut the operation down at once! Chances are that the incident can be kept a very minor one and corrected at a little cost.

Don't make the second mistake—the big one—of trying to cover up the small one. In cargo handling, two wrongs can never make one right.

(Reprinted from the April 1982 issue of Imperial Oil Limited's Marine Division Safety Bulletin) ⚓

Sinbad of the Coast Guard

by Photojournalist Paul Powers, Headquarters Photo Team

He was a runty, barrel-chested little mongrel with plenty of bad habits as well as some endearing ones. His name was Sinbad, and he was the mascot of the Coast Guard Cutter CAMPBELL.

It's been 30 years since Sinbad ambled around the decks of the CAMPBELL. The much-loved little fellow passed away December 31, 1952, at the age of 15. However, stories about the sea exploits and the shoreside antics of the lively dog are still told and retold around the Coast Guard. The escapades of this four-footed sailor are as colorful as those of the most wayward old salt.

At sea, Sinbad could hold his own on a pitching deck, scurry up and down the ladders, and swim with the best. While on shore leave or liberty, he relaxed from the rigors of the ocean's strenuous life by drinking and chasing lady dogs.

Sinbad's shoreside shenanigans are legendary. When the CAMPBELL tied up, he would dash off the ship ahead of the crew and make a beeline for one of his favorite watering holes.

Braving the glaring bar lights and blaring juke boxes, Sinbad would swagger through the rowdy crowds that frequent seaport town bars and head for an empty stool.

He was known by bartenders in ports around the world. They knew what he drank, and they also knew that the CAMPBELL's crew would take care of his tab.

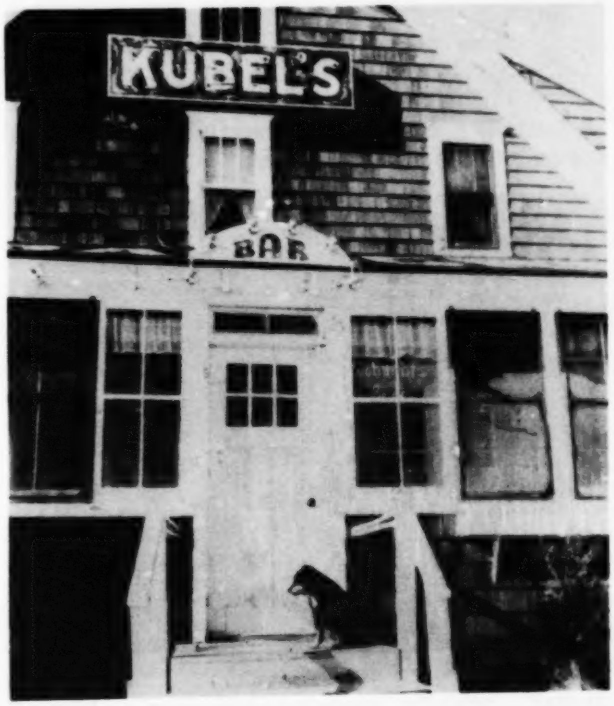
His favorite tipple was a beer followed by a whiskey chaser.

Sinbad would greedily lap it up, woof a farewell, and repeat the ritual in the next waterfront tavern. When he had had his fill, Sinbad would either prowl the alleys in pursuit of more lusty adventures or stagger back to the ship to sleep off his drinking spree.

Next to drinking, Sinbad loved other dogs, as long as they were female. He had a string of admirers in every port and would visit his lady friends after satisfying his gigantic thirst. His romantic exploits were as outrageous as his legendary drinking bouts.

Generally the ship's smallest crewmember managed to make it back to the CAMPBELL before it was time to pull out. There was, however, one notable exception. It was in Iceland during World War II. Sinbad had just finished a particularly heavy drinking bout, and, instead of going back to the ship, he decided to sleep it off behind one of the taverns.

Sinbad awoke with a start to the shrill of the CAMPBELL's siren. The ship was about to depart on emergency orders, and Sinbad was going to be left behind. Struggling to his feet,



Sinbad relaxes on the front steps of his favorite bar in Barnegat Light, New Jersey.

he dashed madly to the dock, just in time to see his ship steaming out of the harbor.

Sailors are often a superstitious lot, and the CAMPBELL's crew was no exception. The crewmembers felt that as long as the dog was on board, the ship was safe. They pleaded with the captain to turn around and pick up their mascot. However, the captain said he couldn't and the dog would have to stay behind.

Sinbad knew he was going to be stranded in Iceland and decided to take matters into his own hands (paws?). The little dog plunged into the icy water and began swimming toward his shipboard home. As the crewmen cheered him on, Sinbad plowed his way through freezing water and heavy swells.

The CAMPBELL was now steaming away at seven knots, and there was no chance of the dog's catching up. The captain, realizing that the dog's life was in danger, had a change of heart. He turned the ship around and picked up Sinbad.

Sinbad's career on the CAMPBELL began one winter night in 1937 when the ship was docked in New York. He was smuggled on board and adopted by the crew. By the time he retired, he had traveled over half a million miles and had countless adventures.

Sinbad's main job was keeping up morale. He loved everyone on the CAMPBELL, and in all the years he was on board, he never attached himself to any one person. He was at his best in a crowd and cheerfully played with any sailor who was interested.

Sinbad, proudly wearing his World War II campaign ribbons on his collar, plays tourist while visiting Japan during the CAMPBELL's goodwill visit in the late 1940s.

Sinbad became a favorite of the press after the CAMPBELL's sinking of a German submarine in World War II.

During his long career, Sinbad was on board the Coast Guard cutter during good times and bad. Sinbad went to war on the CAMPBELL and had his most dangerous adventures during World War II. It was also during the war that Sinbad was most helpful to the crew.

The cutter was assigned to protect convoys as they crossed the North Atlantic with men and supplies for the European war. German submarines preyed upon the ships, and the CAMPBELL's job was to protect them.

One Washington's birthday, the CAMPBELL was making a return trip from Europe. The seas were rough, and a cold northeaster wind drove against the ships as the sun set on the convoy. The convoy was midway between the two continents, where the possibility of submarine attack was the greatest.

The men on board the CAMPBELL were tense as they waited for the Germans to make an appearance. The Germans didn't disappoint them. An explosion and flash erupted from the rear of the convoy. A freighter had been hit, and the CAMPBELL wheeled around to save the crewmen of the disabled ship.

Death often stalked a rescue ship. The U-boats would wait near a sinking ship and attack the rescue vessel as it lay dead in the water plucking survivors from the sea. The CAMPBELL's crew knew this as it went about its mission of mercy.

Sinbad sensed the tension in the air but knew that, at a time like this, the best thing he could do was stay out of the way. Crouched in his favorite spot under one of the ship's ladders, he patiently watched the CAMPBELL's crew rescue the men from the sinking freighter.

Halfway through the rescue operation,

another explosion echoed over the scene. A German sub had fired a torpedo at the CAMPBELL; fortunately, it exploded before reaching the cutter.

With the stricken mariners on board, the cutter went into action. The CAMPBELL attacked six submarines that night, and oil slicks were spotted from all six. The cutter also rammed one sub, sending it to the bottom. The CAMPBELL was credited with one sure sinking, but the ramming incident put a huge hole in the CAMPBELL's bow.

The danger of sinking was so great that half the crew was shifted to another vessel. Sinbad stayed on board. The captain and crew felt that as long as the dog was on the CAMPBELL, it would stay afloat.

The crippled cutter limped its way into port, where reporters who had learned of the crew's faith in the little dog waited to capture the story of his bravery during the submarine attacks.

Throughout that long night, Sinbad had growled and barked defiantly at the submarines each time the CAMPBELL had launched its depth charges. It was a life-and-death situation, and Sinbad wanted to do what he could to help his crew.

It was on the mess deck that Sinbad helped out the most. He couldn't bear to see depressed sailors, and the downhearted crew from the sunken freighter was in desperate need of cheering up.

Sinbad swaggered up to the men and began his antics. Soon, frowns turned into smiles as the sailors began playing with the little dog.

Sinbad's reputation began to spread after the sinking of the submarine. He became famous in ports on both sides of the Atlantic. In Londonderry, Ireland, whenever the CAMPBELL pulled in, the papers announced that Sinbad was back in town. His adventures were not limited to the war. The dog was known from Casablanca, Morocco, to Tokyo, Japan.

The CAMPBELL became the envy of the fleet. A crew from another ship attempted to kidnap the little mutt, but, fortunately, Sinbad's loyal crew recovered its mascot moments before the cutter had to leave the harbor.

It was on board the CAMPBELL that Sinbad was most at home. He was completely part of the crew. He had a medical record, personnel file, and a uniform, and he also held a rank.

He even worked his way up to chief petty officer. However, Sinbad was busted the day after his promotion. During the ceremony, he had had enough of the press and stalked off the ship before the photographers had finished taking pictures. After all the press people had left, he returned. The captain didn't like the idea of the dog going "over the hill," so he busted the miscreant back to dog first class.

Sinbad spent a total of 11 years on board the cutter CAMPBELL. Eleven years is a long time at sea, even for two-legged sailors. So, on September 21, 1948, the CAMPBELL's skipper read Sinbad's retirement orders at muster. The faithful mascot was retired to Barnegat Lifeboat Station in New Jersey. His final years were spent on land, a very peaceful change from his rigorous life at sea.

The exploits of this small Coast Guardsman were not only covered by the press, they were also chronicled in a book entitled *Sinbad of the Coast Guard* by George Foley, Jr., published by Dodd, Mead & Company in 1946. The book was later made into a movie.

A true friend of the Coast Guard and mankind, Sinbad and his exploits are forever etched in the memories of those who served with him. ⚓

Sinbad is pawprinted for his service record. He spent a total of 15 years in the U.S. Coast Guard.

"Hello. This is a computer talking to you..."

by LT Ed McKenzie
Assistant Chief
Command, Control, Communications, and Intelligence Staff
Eleventh Coast Guard District

The following article is not intended to reflect current practice. The technology for the type of system described by the author exists, but the Coast Guard has not implemented such a system for merchant vessel personnel.

The scene is the Seaman's Documentation and Licensing section of the regional Marine Safety Office. The documentation clerk at the service counter thinks to himself how different things could be if applicants for documents and licenses were filling out their own forms, using a computer. He imagines a conversation between the computer and an applicant as it would appear on the video display terminal:

Computer: Hello. This is a computer talking to you. I am going to assist you in completing the application you need to get your seaman's document. You will notice that there is a button on the left of the keyboard labeled "YES" and one on the right labeled "NO." Do you see them? If you do, press the button labeled "YES."

Applicant: YES.

Computer: Thanks. Now for the time being, I will be able to continue to talk to you only if you talk to me by pressing either the YES button or the NO button. Do you understand? Press YES or NO button.

Applicant: YES.

Computer: Good. There is another button you can press anytime that you do not understand what it is I am saying or you don't know what to do next. It is the "?" key on the keyboard. It is labeled in red. Do you see it? Press the YES or NO button.

Applicant: YES.

The computer doing the interviewing in this scenario is a microcomputer. Under such a system, the documentation clerk would briefly interview each applicant to determine what application form he needed and then load it into the printer, which would be located at the clerk's position. After this, the applicant would be directed to the computer console to provide the information needed for his application.

The computer would store this information in its internal memory. When the applicant indicated which form he was filling out, the correct interview program would be automatically called up from a floppy magnetic disc. The computer would direct the applicant, at the end of the session, to press the YES button. This would cause the APPLE to commence printing the correct information on the application form already loaded into the printer. By the time the applicant had returned to the clerk's position, the form would be printed. The APPLE screen would then return to the "HELLO" message and be ready to conduct another interview. The documentation clerk, whose involvement up to this point would have been minimal, would take care of the rest of the procedure (creating the paper file, laminating the document, etc.).

One of the nice things about a computer is its infinite patience. A computer can and will answer the same question day after day. Few documentation clerks, working with applicants for eight hours a day, week after week, can be that consistent. Computers don't take coffee breaks, go out to lunch, take vacations, or call in sick, either.

Computer: We will start a new application for you. The following is a list of the items that are required before a Merchant Mariner's Document can be issued:

Three (3) flat-finish wallet-size pictures with the face (chin to forehead) no smaller than 2 x 1½ inches

Original Social Security card

Do you have these things with you now? Press a button.

Applicant: ?

Computer: I am trying to determine if you have the proper things for a Merchant Mariner's Document to be issued.

Pictures:

We need three pictures, one for our files, one for your temporary certificate, and one for your document.

The face needs to be large enough to identify you so no one else can use your document.

The finish needs to be flat so that the edge of the picture can be written on and the Coast Guard seal applied to it.

Social Security card:

Your original Social Security card (or a duplicate issued by the Social Security Administration) is needed in order to make sure that the Social Security Number is the proper one and that no mistake has been made.

I will ask you in a moment if you have the things I talked about. But first, do you understand all that I have said? Press YES or NO.

Applicant: YES.

Computer: Fine. Do you have all the things that I have explained to you?

Applicant: NO.

Computer: Do you have the three flat-finish wallet photos of yourself, as described?

Applicant: NO.

Computer: Do you have the Social Security card, as described?

Applicant: YES.

Computer: OK. Before we can proceed any further, you will have to have the proper photographs. You will need to go get them and bring them back here. If you need to have them taken, the documentation clerk will tell you where that can be done in the local area. Before you leave, please press the reset button. It is located in the upper right-hand corner of the keyboard. It will allow me to help the next applicant with his application. Go now and see the documentation clerk about your pictures. Please press reset.

A computer could be programmed to respond with explanations at any point in this process. If the applicant kept pressing the "?" button, he would get more and more detailed explanations or an explanation from a different point of view.

After the preliminary information had been obtained through YES/NO responses, the computer could teach the applicant how to type in his answers.

Computer: OK. You are being most helpful. Before we can go much further, we'll have to talk about the keyboard in front of you. Do you know how to type? Press yes or no.

Applicant: NO.

Computer: That's no problem. We will take our time going through the information I need in order to complete the application form. You will need to type some things, like your name, address, and other information. Do you understand? Press a button.

Applicant: ?

Computer: So far, I've been able to determine what I needed to know by having you answer YES or NO. In order to complete the application, I need more information, and I need you to give it to me. You will have lots of time to type the information, and it will be easy to correct if you should make a mistake. Do you understand? Press YES or NO.

Applicant: YES.

Computer: Good. Take as much time as you like—speed is not important. What is important is that the information is correct to the best of your knowledge. What I would like for you to do is read each of the questions I will ask carefully before typing your answer. Do you understand? Press YES or NO.

Applicant: YES.

Computer: OK. You are doing very well. After you type in each answer, please read it over very carefully to make sure that it is correctly typed. When you are satisfied that it is correct, press the key marked "RETURN." Pressing the key marked "RETURN" will send the information you have typed on the keyboard into my internal memory. When we are finished, I will tell the printer to print the correct form with the information you have given me on it. Do you understand so far? Press YES or NO.

Applicant: YES.

Computer: If you should make a mistake when you are typing, we can fix it easily. There are two keys with horizontal arrows on them near the RETURN key. Pressing the key with the arrow pointing to the left on it will cause the blinking cursor to backspace over the letters you have typed. As it backspaces, it will remove the letters it goes over. Just back up the cursor until the mistake is removed and type in the correct entry. Don't worry, all the entries will be very short. Do you understand?

Applicant: ?

Computer: If you should find a mistake, it will need to be corrected before the information goes into my memory. If it is not corrected, your application will not be valid. When you press the left-pointing arrow once, the blinking cursor will back up one space and remove the letter to its left. Press it again to back up additional spaces. When all the errors are eliminated, complete the entry with correct letters. Do you understand?

Applicant: YES.

Computer: Fine. After you have corrected the mistake, look over the new information you have typed to make sure it is correct. If it isn't, just backspace again to fix it. If it is correct, then press "RETURN," and it will go into my memory and we will move on to the next item. Do you understand? Press YES or NO.

Applicant: YES.

This method of streamlining the application process would involve an admittedly low level of automation. The documentation clerk, after all, would still have to load the proper form into the printer. It would, however, also be low-cost. All the hardware, software, and furniture could be had for less than $10,000. Economies of scale would prevail where a common printer could be used for multiple applications. Except for maintenance of the hardware, this would be a one-time cost.

Other features could be added to reduce the documentation clerks' work load further. The computer could be loaded with the proper questioning sequence to determine what form the applicant needed. It could then ask the questions which would result in the appropriate answers for that form. The printer would be loaded with blank paper, and the computer would direct the printer to print the correct form and then insert the appropriate information in it. This more elaborate system would probably require several floppy disc drives (or a hard disc) to house the necessary memory. Alternatively, the system used Coast Guard-wide, the Standard Terminal, with its larger memory capability, could be used.

Even this system would still require the documentation clerk to process the application, i.e., create the appropriate paper file and make up the laminated document. As long as fingerprints are necessary, we will probably always need a clerk to make up the document. However, there is no real need for the physical file itself. What is needed, if anything, is a means of looking at the information contained in a file.

This information could be made available in at least two different ways. The easy way would be to have the computer produce a micrographic representation (microfilm, microfiche) of the filled-out form at the end of the interview. The location of this form in the film library could be indexed for future use. Or the computer could file away the information in a data base, extracting the information it needed to fill out the application requested. Information could later be retrieved as necessary.

The data entered by the applicant could be stored and made available each time he returned to upgrade his document. Rather than entering the data all over again, he would simply have to verify that the data on file had not changed.

Computer: OK, Mr. ________________, our records show that you applied for a document in June of 1981. In order to speed up the renewal process, I am going to display the information in your file that is needed for this application. As I display it, please indicate if it is still correct or if it has changed. If it is correct, just press the YES button. If it is no longer correct, press the NO button, and we will enter the correct information. Do you understand?

Applicant: YES.

On another level, if the Coast Guard wished to collect various data about each applicant, it could turn to a sophisticated system such as the Standard Terminal. A local data base could be established on all the applicants from the area and maintained in the computer's memory. The computer could produce periodic reports on such matters as how many mistakes were made in answering a particular question or how long it took to answer a specific question. The Coast Guard could use this information to improve the interview program.

The ultimate applicaton of computerized interviewing would be to tie all Regional Examination Center (REC) Standard Terminals into a common, Coast Guard-wide personnel data base. This, which would be similar to the system being instituted for vessels, would eliminate the redundancy of having files on a seaman at every office where he has had action taken on his document. Such a system could be updated daily, during off-hours, completely without operator intervention. The computer terminals could communicate with each other automatically over the telephone.

The system I have sketched above could be used for licenses as well as documents. Although the array of licenses, documents, and endorsements may be intimidating, it can nevertheless be reduced to a step-by-step presentation on a video screen. All that is needed is correct input of the necessary material by the person who benefits most from having his documents filled out properly.

Is this part of the Marine Safety Office of the future? Will the merchant mariner accept the idea of talking to a computer instead of a real person? Can the use of automated application procedures produce sufficient savings to justify the initial cost? Computers are now doing word processing, running robots that make automobiles, and providing precise positioning information to navigate Very Large Crude Carriers. Are automated documentation and licensing next? ⚓

Safety Films from England

England's Merchant Navy Training Board has produced a number of films for its Safety at Sea series. Among the films, which are available to the general public, are:

"The Use of Compressed Air Breathing Apparatus"

Self-contained breathing apparatus is equipment that is easy to use. It is, however, vitally important that anyone who may be called upon to use it understand in simple terms how it works and how to don and wear it. Getting across that information is the purpose of this film.

There are a number of manufacturers of breathing apparatus, and, consequently, there are differences between sets. Instructions for use may vary according to what purpose the set is intended to serve. In the film, a familiar type of compressed air breathing apparatus is used for demonstration purposes. The basic principles of operation and wearing are the same for similar types made by different manufacturers.

Color: 11 minutes

"Enclosed Spaces"

At the start of this film, a crewmember sets out to do a simple job--open a valve to ballast a tank. The valve is jammed, so he enters the tank to find out what is wrong. He goes in without telling anyone, however, and without taking any precautions; he dies, overcome by the lethal atmosphere. This tragedy could have been avoided--if only he had followed the rules.

The film shows what actions a person should take before entering an enclosed space.

Color: 19 minutes

A booklet, "Recommendations on Entering Enclosed Spaces," and a laminated safety check-list card *(see following article)* prepared by the General Council of British Shipping are available to accompany this film.

"The New Rules"

1972 COLLISION REGULATIONS - MAIN CHANGES

This is a training/information film for serving masters and officers who are already familiar with the 1960 Regulations for the Prevention of Collisions at Sea. The film illustrates some of the more significant changes in the 1972 Regulations, which entered into force on July 15, 1977. The film is of value to serving masters and watchkeepers aboard ship but can also be used to teach the 1972 Regulations to trainees.

Color: 17 minutes

DANGEROUS GOODS AT SEA TRAINING PACKAGE

This package consists of two films on the carriage of packaged dangerous goods at sea together with some background training notes.

Part 1 "Dangerous Goods at Sea"

The carriage of dangerous goods on board ships has increased dramatically in recent years, as the world has become more heavily dependent on chemicals and other hazardous products. Nearly all ships, worldwide, whether ferries, RoRo, container, or conventional cargo carriers, are likely to carry some dangerous cargo at some time. But what are the dangers? How can they be recognized? What precautions can be taken?

These are some of the questions that "Dangerous Goods at Sea" sets out to answer. This training film explains the key principles and procedures underlying the safe carriage of dangerous goods. The foundation of the film is the International Maritime Dangerous Goods (IMDG) Code produced by the International Maritime Organization (IMO). The film demonstrates what the Code means in practice.

"Dangerous Goods at Sea" covers each of the main stages in the safe transport of this kind of cargo and will be of value to both seafarers and associated shore personnel.

Color: 20 minutes

Part 2 "Expecting the Unexpected"

The potential hazards associated with the carriage of packaged dangerous goods are controlled by following the advice and procedures in the IMDG Code and the various national codes which exist. Occasionally, however, the unexpected will occur, and the consequences can be far-reaching: fire, stranding, and possible pollution of the marine environment. "Expecting the Unexpected" shows how good planning and management can minimize the effects of incidents. Whatever the substance involved, the same general principles can be followed. Response is based on a pre-determined plan of action that is activated as soon as the problem has been discovered and the alarm raised.

Throughout the film the value of the IMO Emergency Schedules for Ships Carrying Dangerous Goods and the need for training and "good housekeeping" are emphasized.

Color: 20 minutes

SURVIVAL TRAINING PACKAGE

Survival training has assumed increasing importance in recent years, and two films have been produced on personal survival and good life raft practice.

Part 1 "This is Your Life (Raft)"

This film covers the action to be taken prior to abandonment, shows how to launch a life raft, and explains the raft's construction and contents. It provides sound background information in a logical, easy-to-understand manner and can serve either as an introduction for pre-sea trainees or as a refresher for the experienced seafarer.

Color: 15 minutes

Part 2 "Survival at Sea"

One of six people cast into the cold sea helps the other five pull themselves together, carry out vital initial actions, and settle down to await the rescue they are sure will come.

The basic message of this film is simple:

- Prepare yourself—know your job in an emergency.
- Keep as warm and dry as possible.

- Know your raft and its contents.
- Establish the current survival priorities.
- Follow the basic rules of survival.

Color: 28 minutes.

A Survival Instructors Manual and a set of slides are also available.

OTHER TITLES

The following films are also available through the Board:

"To Hell With Accidents"

This is a film about accidents on board a ship. An unwanted passenger, invisible to the crew, joins for the voyage. Through his eyes, the events leading to accidents are portrayed. As the story unfolds, the results of carelessness, neglect, and the unsafe practices of the ship's personnel are shown. The climax is a fatal accident caused by the folly of the victim, and the evil passenger is seen leaving to seek his next ship. The film draws attention to the need for common sense and good housekeeping in routine shipboard duties. It shows dramatically what can happen if care is not taken.

Color: 23 minutes

"Fire Below"

"Fire Below" is about the total loss of a ship at sea because of fire. The events on board are recalled as a court of inquiry relentlessly examines every circumstance and questions each witness. The court is concerned only with finding out why and how the ship was lost. Existing regulations may be amended or new ones formulated on the basis of the findings. New procedures for fire prevention, fire drills, maintenance of equipment, or training of personnel may be devised—everything will be done to safeguard ships and crews from the hazards of fire at sea.

Color: 26 minutes (video only)

All inquiries concerning the purchase or renting of films should be addressed to

Merchant Navy Training Board (Films)
30/32 St. Mary Axe
London EC3A 8ET
ENGLAND
Tel.: 01-283 2922
Telex: 884008

All titles, unless otherwise noted, are available on either 16mm film or Sony U-Matic Videocassette (PAL). Details on other video systems, foreign-language versions, etc., will be supplied on request. ⚓

A Clean Slate for Safe Entry

The General Council of British Shipping has recently published a handy laminated safety check-list card which should be used by shipboard personnel before entering enclosed spaces such as cargo tanks, pumprooms, cofferdams, ballast tanks, etc.

Personnel entering a tank or other enclosed space may encounter unusual and frequently unexpected acute hazards. Certain fundamental precautions and simple procedures can prevent accidents. The hazards and combinations of hazards encountered will differ in their nature and seriousness. The following guidelines for use of the safety card offer practical advice for dealing with enclosed spaces.

Responsibility

Responsibility for safety, both at the time of entry and during the entire operation, rests with the master or designated officer. This responsibility covers conditions of work for shore-based employees as well as for members of the ship's crew. The responsible person must make sure adequate steps have been taken to eliminate or control hazards. He must also make sure that all personnel understand the nature of the hazards which remain and the precautions which must be taken.

Enclosed Spaces

Enclosed spaces include any tank, cargo space, or compartment in which toxic, inert, asphyxiating, flammable, or other dangerous gases may accumulate or oxygen may be deficient, such as:

- any space containing or having last contained combustible or flammable cargo or gases in bulk,
- any space containing or having last contained cargoes of a poisonous, corrosive, or irritant nature,
- spaces in tankers immediately adjacent to the two types of spaces just described,
- cargo spaces or other spaces that have been closed and/or unventilated for some time,
- storerooms or spaces containing noxious or harmful materials, and
- spaces that have been fumigated.

Hazards

The hazards commonly encountered in an enclosed space are:

- toxic vapors in fatal concentrations. These may result from known material in the space, be gradually released from sludge or scale, or be introduced by leakage from interconnected systems.
- flammable gases with the potential for fire or explosion.
- lack of oxygen. This, which may result in asphyxiation, can be caused by chemicals which absorb or replace oxygen in the atmosphere or by inert gas often used to exclude oxygen to reduce the possibility of explosions. The atmosphere in a space that has remained closed for some time may become deficient in oxygen because of rusting steelwork. Improper or inadequate ventilation while work is in progress within the space may also result in a lack of oxygen.
- electric shock from portable lights, power tools, or associated electrical equipment.
- bodily injury from direct contact with corrosive or irritant substances.

Procedures

The hazards inherent in working in an enclosed space can be avoided or overcome if the following rules are observed each and every time a space is entered.

Rule 1. Establish a system of planning for enclosed space entry and a crew instruction program.

Rule 2. Prepare the space for entry by physically isolating it, cleaning it to remove contaminants, and testing to ensure absence of such contaminants.

Rule 3. Use a check list, backed up if necessary by a permit system. The check list should be given to another crewmember only after the master or responsible officer is personally satisfied with the precautions taken, the personal protective equipment to be used, and the procedures to be followed.

Marine Safety Card

The Marine Safety Card serves as a means of reminding all concerned of recommended procedures. Proper completion of its re-usable check list will ensure that all existing hazards are considered and evaluated and that, where necessary, the correct protective measures are taken. The card has been designed so that it can be used on board all types of ship, from the largest tanker to a small coastal vessel. Instructions and advice shown on the card are not intended in any way to take the place of other rules and recommendations. The card may, however, be used to support these. It may also be used in conjunction with a permit system. In order to be successful, the Marine Safety Card must be supported by senior ship's personnel; the response of other crewmembers will obviously be influenced by this.

The card is available from the General Council of British Shipping at 30/32 St. Mary Axe, London EC3A 8ET, England. ‡

New Reports Available from Ship Structure Committee

The Ship Structure Committee recently published 11 new technical reports which are available free of charge until copies run out. From that point on, they will be available from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The reports are:

SSC-303 **"Fatigue and Fracture Toughness Characterization of SAW and SMA A537 Class I Ship-Steel Weldments"**

This report assesses various notch toughness tests and criteria to determine their validity at low temperatures when applied to structures with low toughness in the heat-affected zone.

SSC-304 **"SL-7 Extreme Stress Data Collection and Reduction"**

This report tells how bending moment data aboard the SL-7 class were collected and reduced for a total of 56 statistical ship years of operation. It also describes the scratch gauges used to collect the data and gives examples of some of the data obtained.

SSC-305 **"Investigation of Steels for Improved Weldability in Ship Construction—Phase II"**

This report describes the second phase of an overall effort to develop economical high-strength ship-plate steels with improved heat-affected zone toughness for electroslag and submerged arc welding processes. In Phase II, 20 laboratory-melted steels of varying chemical composition were tested and recommendations were made for Phase III.

SSC-306 **"Experimental Program for the Determination of Hull Structural Damping Coefficients"**

This report describes one way of collecting and evaluating structural damping data (either model or full-scale) applicable to ship vibration analysis. It also tells how to relate those data to the design process.

SSC-307 **"Evaluation of Fracture Criteria for Ship Steels and Weldments"**

This report presents a state-of-the-art interpretation of the correlation of fracture toughness in ship steels and weldments to proposed criteria for adequate fracture resistance in service.

SSC-308 **"Criteria for Hull-Machinery Rigidity Compatibility"**

This report suggests a method by which a designer, when considering hull flexure, could address the problem of meeting distortion limits imposed by machinery manufacturers.

SSC-309/ SSC-310 **"A Rational Basis for the Selection of Ice Strengthening Criteria for Ships—Vols. I and II"**

This report contains the results of a survey of various classification societies and government regulations aimed at identifying similarities and differences in requirements. It recommends a procedure for selecting appropriate criteria for strengthening a vessel for operating in ice.

SSC-311 **"Evaluation of SL-7 Scratch Gauge Data"**

This report assesses the value and application potential of the SL-7 scratch gauge data base and statistical models to predict beyond the range of measured values.

SSC-312 **"Investigation of Internal Corrosion and Corrosion-Control Alternatives in Commercial Tankships"**

This report is a review and reevaluation of various corrosion-control philosophies. The report includes sensitivity studies of the relative life-cycle costs of available corrosion-control techniques.

SSC-313 **"SL-7 Research Program Summary, Conclusions and Recommendations"**

This report synopsizes the multi-year cooperative effort by industry, government, and the American Bureau of Shipping to acquire full-scale, model, and analytical data and to evaluate them for the large, high-speed SL-7-class containerships.

For copies of these reports or further information, contact LCDR David B. Anderson, Secretary, Ship Structure Committee, U.S. Coast Guard (G-MTH-4/13), Washington, DC 20593.

The Ship Structure Committee is an interagency advisory committee dedicated to improving the structure of ships. Its member agencies are the United States Coast Guard, the Naval Sea Systems Command, the Military Sealift Command, the Maritime Administration, the Minerals Management Service, and the American Bureau of Shipping.

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Lessons from Casualties

The following is taken from a letter written by LCDR T. H. Jenkins, Captain of the Port, Los Angeles-Long Beach:

Hatch cover accidents are unfortunately routine on board vessels of the United States Coast Guard, Navy, and Merchant Marine. They often result in permanent loss of several fingers or, in the case of falls, spinal injuries rather than simple fractures which would eventually heal completely. While anyone can and theoretically should take the time to find and use a piece of line or chain in the absence of an installed safety device, few will actually bother.

It is often easy to drill through a hatch support brace and the peg or socket to which it mates and install a toggle pin with a small chain or cable to prevent loss. If this is not feasible in a particular location, a latch which catches the hatch when it is opened but must be lifted to close the hatch may be installed on an adjacent bulkhead. Such a latch should also be equipped with a toggle pin.

If ships' officers and crews would routinely look for these safety devices and install or replace them as soon as they noticed them missing, the frequency of this common accident could be reduced. In a year and a half as Safety Officer and First Assistant Engineer on a Coast Guard cutter, I rarely went a month without ordering the replacement of a missing toggle pin somewhere on the ship.

Chemical of the Month

Methyl Methacrylate:

$CH_2 = C(CH_3)COOCH_3$

Synonyms:	acrylic resin monomer MMA
Physical Properties	
boiling point:	101°C (214°F)
freezing point:	-48°C (-54°F)
vapor pressure at	
20°C (68°F):	29 mm Hg
25.5°C (78°F):	40 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	100 ppm; 410 mg/m^3
short term exposure limit:	125 ppm; 510 mg/m^3
Flammability Limits in Air	
lower flammability limit:	2.1% by vol.
upper flammability limit:	12.5% by vol.
Combustion Properties	
flash point (c.c.):	9°C (49°F)
autoignition temperature:	435°C (815°F)
Densities	
liquid (water = 1.0):	0.94
vapor (air = 1.0):	3.45
Identifiers	
U.N. Number:	1247
CHRIS Code:	MMM
Cargo Compatibility Group:	14 (Acrylates)

Methyl methacrylate (muh-THAK-ruh-late) is a clear, flammable liquid with a sharp, fruity acrylic odor. It is more readily known to the general public as the clear, hard plastic marketed under the trade names Plexiglas® (Rohm & Haas) and Lucite® (Du Pont), to name just two.

Plexiglas® and Lucite® are actually the "polymer" form of methyl methacrylate. Polymers are compounds consisting of linked "monomers," or chemical building-block molecules. In the case of methyl methacrylate, the polymer is made up simply of the chemical repeating itself over and over again. German chemist Otto Rohm, in his doctoral thesis in 1901, first described the chemical structure of the parent methacrylate compounds and the methyl and ethyl polymers. In 1909 he formed Rohm & Haas with Otto Haas, and in 1931 the company began commercial production of the methacrylates. Today, the Rohm & Haas Company is one of the world's leading producers of methacrylate monomers and polymers, not only the methyl and ethyl derivatives, but also the many other varieties available.

Methyl methacrylate needs to be inhibited during shipment and storage; in other words, a chemical must be added to keep the methyl methacrylate from reacting with itself ("self-polymerizing"). If controlled, this process gives us the valuable plastics mentioned above, but, if uncontrolled, self-polymerization can be a violent process. It can be initiated by heat, contamination by such things as acid or rust, loss of the inhibitor's effectiveness because of inert atmosphere (these particular inhibitors require oxygen), moisture (which promotes formation of a "popcorn polymer" and causes rust—a source of contamination—to form on mild steel), or aging (probably more important a consideration for long-term storage than for shipment). The need for inhibition applies to both bulk and package shipment of methyl methacrylate; the only exception is package shipment of a very high purity grade. It should be noted that the inhibitor's effects do not extend to methyl methacrylate vapors. These vapors may polymerize on flame screens or in vents and result in stoppage of a vent. Flame screens and vents should thus be checked regularly for polymer buildup.

Personnel involved in the handling or transferring of methyl methacrylate should wear chemical goggles or a face shield, impervious gloves and clothing, and protective boots. Overexposure may cause irritation of the skin and eyes. The vapor is irritating to the respiratory tract and, at high levels, may also cause drowsiness and possibly unconsciousness. If methyl methacrylate gets into a worker's eyes, they should be flushed immediately with large amounts of water and medical assistance should be obtained as soon as possible. Contact lenses should not be worn by personnel handling this chemical. If liquid methyl methacrylate splashes on a worker, he should wash the affected skin area with soap and water and remove and launder his contaminated clothing before wearing it again. If a rash develops, he should seek medical attention. If liquid methyl methacrylate is ingested (swallowed), vomiting should be induced if the victim is conscious and medical attention should be sought immediately. Inhalation of the vapor should be treated by removal of the victim to fresh air and artificial respiration, if needed. Again, medical attention should be sought.

Methyl methacrylate is flammable. All sources of ignition should thus be eliminated, and all containers should be grounded to prevent static electricity charges. Fires involving methyl methacrylate must be fought with extreme care, preferably from a distance or a protected location. This is because of the possible violent polymerization reaction brought about by heat. Suitable extinguishing agents are alcohol foam, dry chemical, CO_2, and water fog. The water fog can be used to keep containers cool. Firefighting personnel should wear self-contained breathing apparatus, impervious protective clothing, and eye protection.

The U.S. Coast Guard regulates methyl methacrylate as a Subchapter O cargo (Title 46 of the Code of Federal Regulations; Part 151 for tank barges and Part 153 for tankships). IMO, the International Maritime Organization, regulates it for bulk shipment in Chapter 6 of the Chemical Code and includes it in the IMDG (International Maritime Dangerous Good) Code for package shipments (page 3091). The U.S. Department of Transportation classifies it as a flammable liquid, and IMO assigns it to Hazard Class 3.2. Both the U.S. Environmental Protection Agency and IMO consider methyl methacrylate a Category D Pollutant.

Cargo and Hazards Branch*
Marine Technical and
Hazardous Materials Division

* The Hazard Evaluation Branch (G-MTH-6) and the Cargo Systems Branch (G-MTH-3) have merged to form the Cargo and Hazards Branch (G-MTH-3).

Fire Hose Doubles as Ice Rescue Equipment

(Reprinted with permission from the National Safety Council's Recreational Newsletter, *January-February 1982)*

Fire hose and a pressurized air cylinder , standard pieces of firefighting equipment, have been combined to form a unique new water and ice rescue device.

The device is simple: one or more 50-foot sections of 2½-inch or 3-inch hose are charged with air from the air cylinder carried on all fire apparatus for use in breathing masks. Once filled with air, the hose becomes rigid and buoyant. Tests have shown that a 50-foot section will support 10 or more people. In one particular test, it was demonstrated that during a panic situation it was possible to rescue up to eight adults, if they were convinced they should hold on.

Any number of sections may be joined and pushed out into a river, lake, or ice-covered body of water (or even a hydraulic created by low head dams) to effect a rescue.

The hose rescue tool can be placed in service fast. It can be brought to wherever needed with a minimum of personnel. It requires approximately 6 seconds to fill a 50-foot section of hose to the recommended 100 psi from a 30-minute, 45-cubic-foot capacity air cylinder. It will drop the pressure in the air cylinder approximately 500 to 600 psi. The pressure in the hose is regulated to a maximum of 120 psi by a relief valve on the rescue device.

For more information about the fire hose rescue device, write to the International Association of Dive Rescue Specialists, 1449 Riverside Drive, Fort Collins, Colorado 80524. ⫱

Rear Admiral Kenneth G. Wiman
Chief, Office of Research and Development

Rear Admiral Kenneth G. Wiman was born in Kearny, New Jersey, on October 1, 1930, and graduated from North Arlington High School, North Arlington, New Jersey, in 1948. He began his career in the Coast Guard as an Ensign following graduation from the U.S. Coast Guard Academy in New London, Connecticut, in June 1952.

He served his first assignment as Watch Officer on board the United States Coast Guard Cutter RAMSDEN, a destroyer escort operating in the Pacific out of Honolulu. This assignment, which lasted a year, included operations in the Korean campaign area. Transferred in September 1953, he next served as Student Engineer Officer on the cutter MACKINAC for a year, after which he served as Assistant Engineer on the cutter CAMPBELL for six months; both of these were cutters operating out of New York on ocean station patrol and search and rescue. From May 1955 to March 1956, he served as Engineer Officer on the cutter MENDOTA, based at Wilmington, North Carolina.

He was next assigned as a student at Rensselaer Polytechnic Institute in Troy, New York, where he earned a Bachelor of Civil Engineering Degree in September 1957. From there he reported to the Coast Guard Base in Ketchikan, Alaska, where he served as Industrial Manager and also as Executive Officer for several months. In August 1959, he was assigned as Assistant Chief, Civil Engineering Branch, at the Seventeenth Coast Guard District office in Juneau.

From March 1961 to June 1965, he served as Project Engineer in the Civil Engineering Division at Coast Guard Headquarters in Washington, DC. In May 1965, then Lieutenant Commander Wiman served as a U.S. delegate to the Seventh International Conference on Aids to Navigation in Rome, Italy. He served other temporary assignments on a Loran program in Germany, Denmark, Greenland, and the Faeroe Islands.

During the next two years, he was stationed at the Coast Guard Base in Galveston, Texas, as Deputy Group Commander and Executive Officer.

In July 1967, he returned to the Coast Guard Academy to become Chief of the Physical Plant Division. In July 1970, he returned to Headquarters to serve as Assistant Chief, Civil Engineering Division, Office of Engineering. In December 1972, he moved to the Office of Marine Environment and Systems at Headquarters, where he served as Chief, Bridge Division, until July 1974, and then as Manager, Deepwater Ports Project, for two years. For exceptionally meritorious achievement in the latter duty he was awarded the Meritorious Service Medal (1975).

In June 1976, then Captain Wiman assumed command of Coast Guard Base Gloucester in Gloucester City, New Jersey, with additional duties as Captain of the Port of Philadelphia. He was awarded a second Meritorious Service Medal in June 1979 for performance in that assignment. He subsequently returned to Headquarters as Deputy Chief of the Office of Marine Environment and Systems and was awarded a third Meritorious Service Medal upon completion of that assignment.

He assumed his present assignment in June 1981.

Following is a resume of his appointments in rank:

- Cadet, July 1948
- Ensign, June 1952
- Lieutenant (junior grade), December 1953
- Lieutenant, February 1957
- Lieutenant Commander, February 1963
- Commander, April 1967
- Captain, July 1973
- Rear Admiral, June 1981

Rear Admiral Wiman has been a registered Professional Engineer since 1961. He holds memberships in the Society of American Military Engineers, the American Society of Civil Engineers, Tau Beta Pi (the National Engineering Honor Society), and Chi Epsilon (the National Civil Engineering Honor Society).

Rear Admiral Wiman's wife is the former Virginia M. Bowling of New London, Connecticut, who attended the University of Connecticut. The Wimans have five children: Stephen, Keith, Carl, Gail, and Susan.

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations.

DECK

1. According to the International/Inland Rules, which vessel is not considered a "vessel restricted in her ability to maneuver"?

A. A vessel engaged in the launching or recovery of aircraft
B. A vessel engaged in minesweeping operations
C. A vessel engaged in dredging
D. A vessel engaged in trawling

REFERENCE: International Rules of the Road

2. The two most effective generating forces of surface ocean currents are

A. temperature and salinity differences in the water.
B. wind and density differences in the water.
C. water depth and underwater topography.
D. rotation of the earth and continental interference.

REFERENCE: Bowditch

3. Latitude on the terrestrial sphere is comparable to what on the celestial sphere?

A. Altitude
B. Right ascension
C. Celestial meridians
D. Declination

REFERENCE: Crawford, Celestial Navigation

4. Before operating a fixed CO_2 system, you should

A. evacuate all personnel from the area.
B. secure appropriate remote shut-downs.
C. shut down the ventilation system.
D. do all of the above.

REFERENCE: CG 329, Sec. 3-4-13

5. The upward slope of a ship's bottom from the keel to the bilge is known as

A. camber.
B. slope.
C. dead rise.
D. keel height.

REFERENCE: Ship Construction

ENGINEER

1. The empty weight of a "100-lb." bottle in a fixed CO_2 system is 130 lbs. What is the minimum acceptable weight the cylinder may have before recharging is required?

A. 200 lbs.
B. 210 lbs.
C. 220 lbs.
D. 230 lbs.

REFERENCE: 46 CFR 91.25-20

2. Ships are less stable when water or fuel tanks are partially filled because of the

A. free-surface effect.
B. increase in buoyancy.
C. decrease in draft.
D. reduction in trim.

REFERENCE: P.N.E. NAVPERS

3. When you are wearing any type of gas mask, fresh-air hose mask, or self-contained

breathing apparatus, you should immediately return to fresh air if you feel

A. heat in the canister or hose.
B. excess air flow in the mask.
C. air leakage from the facepiece.
D. nausea, dizziness, or high breathing resistance.

REFERENCE: MarAd Firefighting & Safety

4. Why is it necessary to wear a fresh-air hose mask or self-contained breathing apparatus to safely enter a sealed tank or compartment where the atmosphere is unknown?

I. The tank or compartment may not contain enough oxygen to support life.
II. The tank or compartment may contain a toxic atmosphere.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

REFERENCE: MarAd Firefighting & Safety

5. A tank which has been sealed for a long time could be dangerous because

A. steel surfaces consume oxygen by rusting.
B. a vacuum usually forms in a sealed tank.
C. moisture condenses in the tank, displacing the oxygen.
D. most tank coatings give off poisonous vapors in the presence of moisture.

REFERENCE: MarAd Firefighting & Safety

ANSWERS

DECK
1.D;2.B;3.D;4.D;5.C
ENGINEER
1.C; 2.A; 3.D; 4.C;5.A

If you have any questions about the Nautical Queries, please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; tel.: (405) 686-4417.

Medical Corpsmen Learn CPR While at Sea

Hospital corpsmen assigned to the USS PROTEUS recently underwent 13 hours of intensive training in cardiopulmonary resuscitation (CPR) while "at sea" during a 3-day training period.

CPR is a life-sustaining skill which combines breathing and chest compression in an attempt to save the lives of people whose heart and lungs have stopped functioning.

Chief Henry O. Grady, applying chest compression, demonstrates advanced CPR to medical corpsmen on the USS PROTEUS. Photo courtesy of the American Heart Association

Chief Hospital Corpsman Henry O. Grady, an American Heart Association-certified instructor in CPR assigned to the Naval Regional Medical Branch Clinic at Naval Station, Guam, joined the PROTEUS for the March 4 - 6 underway period to conduct the training.

"CPR is an essential skill for a shipboard environment," said PROTEUS lieutenant Harrison Kerchner, Medical Division Officer. "The hazards of shipboard duty range from drowning to electrical shock. These hazards, coupled with the natural causes of cardiac arrest, make it a matter of 'the more, the better' as far as CPR training is concerned."

This CPR training is just a first step. The next is to certify the entire staff of hospital corpsmen as American Heart Association CPR instructors who will then be able to train the ship's company in continuing a certification and recertification program.

Information on CPR training is available from the American Heart Association, National Center, 7320 Greenville Avenue, Dallas, Texas 75231. Individuals wishing materials should contact their state heart associations.

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